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GEOARCHEOLOGICAL INVESTIGATIONS AT THE CLEAR CREEK GOLF COURSE SITE (41CV413),

FORT HOOD, TEXAS Gemma Mehalchick Kyle Killian Karl W. Kibler Douglas K. Boyd

United States Army Fort Hood Archeological Resource Management Series Research Report No. 46







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Directorate of Public Works Environmental Management Office Fort Hood

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EXECUTIVE SUMMARY

REPORT PURPOSE

This report was prepared by Prewitt and Associates, Inc., Cultural Resources Services, of Austin, Texas, for the Directorate of Public Works, Environmental Management Office, Fort Hood. It was done under contract with the United States Army (Army) Fort Hood to evaluate the archeological research potential and National Register eligibility of site 41CV413, located on the Clear Creek Golf Course. The site was damaged in February of 1999 when private contractors used heavy machinery to remove trees during a golf course renovation construction project. After this incident, the Army determined that extensive damage was done to the upper 20 cm of cultural deposits over a 6,439-m² area, and severe damage was done to deeper deposits where large trees were uprooted. The Army then decided that archeological testing was needed to determine if any intact cultural deposits still remained, and, if intact deposits were encountered, whether those cultural deposits were significant and eligible for listing on the National Register of Historic Places (NRHP). National Register criteria are used to measure the importance (or research potential) of prehistoric archeological sites as defined in Significance Standards for Prehistoric Cultural Resources: A Case Study from Fort Hood, by Lain Ellis, Christopher Lintz, W. Nicholas Trierweiler, and Jack M. Jackson (1994).

METHODOLOGY

Archeological testing of Subarea B, the alluvial terrace, of 41CV413 was done in May 1999. Work consisted of a surface inspection and geomorphic reconnaissance, mechanical excavation of 19 backhoe trenches, and hand excavation of 11 test units. Eleven archeological features, including a large burned rock midden complex and a human burial, were investigated; 4,318 artifacts were recovered.

RESULTS

Archeological testing revealed that despite extensive damages across a large area, a substantial amount of buried cultural deposits remain intact. Site 41CV413 is recommended as eligible for listing on the NRHP.

RECOMMENDATIONS

Under the 1966 National Historic Preservation Act (PL 89-655, as amended), the Army is responsible for protecting archeological sites determined to be eligible for listing on the NRHP. They should make every effort to ensure that no further damage occurs at 41CV413. The Army should pursue archeological data recovery as a mitigative measure for damage to the resource, and the investigations should follow a research design plan similar to that outlined in *Summary of National Register Testing and Data Recovery Research Design for Archeological Investigation of 41CV413, Fort Hood, Texas*, by Douglas K. Boyd (1999). This document is presented in Appendix F.

ABSTRACT

Intensive geoarcheological investigations were undertaken in May 1999 at the Clear Creek Golf Course site on Fort Hood. Designated 41CV413, the tested portion of this site is located on and within the alluvial terrace of Clear Creek, a tributary to House Creek in the southern portion of Fort Hood, southwestern Coryell County. Although severely damaged during construction activities in February 1999, excavation of 19 backhoe trenches and 11 test units revealed that substantial buried cultural deposits remain intact in Subarea B.

Archeological testing concentrated on a burned rock midden complex (either one large midden or two to three separate smaller middens) in the central portion of Subarea B, but some testing of nonmidden deposits also was completed. Other features encountered are internal hearths or earth ovens and nonmidden hearths and activity areas. A human burial found at the base of the midden deposits was partially disturbed by the backhoe, but the rest of the burial was not excavated.

Archeological work recovered 4,318 artifacts, including 99 dart points that consist of predominately Late Archaic styles. The temporally diagnostic points, along with four radiocarbon assays on feature-associated charcoal, indicate that occupations on the terrace began near the end of the Early Archaic period, and the burned rock midden may have begun to accumulate at that time or during the Middle Archaic period. However, most of the cultural activities and midden formation occurred in the Late Archaic period. There is no evidence of late Prehistoric occupation or midden use. The midden developed in West Range alluvium directly on exposed Fort Hood channel gravel deposits (i.e., old point bars of Clear Creek), and the location appears to have been intentionally selected to take advantage of the abundant source of naturally size-sorted rocks. These channel gravels are composed primarily of tabular limestone cobbles that are of sufficient size (e.g., 15–60 cm) for use in constructing earth ovens and hearths. Although the relationships between the midden and nonmidden cultural deposits are poorly understood, the site has a high research potential. Site 41CV413 is recommended as eligible for listing in the National Register of Historic Places.

ACKNOWLEDGMENTS

The 1999 field investigations at 41CV413 were conducted under direction of Kimball Smith, then director of the Cultural Resource Management Program (CRMP) at Fort Hood. When Smith death in October 1999, Dr. Cheryl Huckerby took over as the CRMP director. These people played crucial roles in developing and successfully completing this project. Lester Duncan operated the backhoe in his typical efficient manner. All of these individuals have assisted us in our work for several seasons, and their efforts are greatly appreciated.

Douglas K. Boyd served as Project Manager and Principal Investigator. Ross C. Fields served as Quality Control Officer to ensure that archeological work was done properly in the field and laboratory. Gemma Mehalchick served as Project Archeologist, with the help of Assistant Project Archeologist Kyle Killian. Together they supervised field crews; directed the geomorphic reconnaissance and mechanical and hand excavations; coordinated the project schedule with various Fort Hood departments and divisions; compiled and organized testing records, photographs, and collections; completed the videotape documentation; and planned and executed all phases of the artifact and data analysis. Field crew members for this project were Mark Holderby and Mike Wilder. Karl W. Kibler served as Project Geomorphologist.

Daily operations in the field and lab were coordinated by Jeanine Cuellar, Business Manager. Laboratory work was conducted and supervised by Laboratory Director Karen Gardner and Laboratory Assistant Susan Pierce-Rimbey. They kept track of the computerized provenience and artifact databases for the analysis phase and prepared all collections and records for curation. This report was edited by Mr. Boyd and Mr. Fields, and report production and technical editing were done by Melissa Keenan, Jane Sevier, and Audra L. Pineda. The figures were drafted by cartographers Brian J. Wootan and Sandra L. Hannum, and artifact photographs were taken by Jack Rehm.

This report was reviewed for the Archeology Division of the Texas Historical Commission by Ed Baker. Steve Black and Linda Ellis also served as peer reviewers for this report.

Two people were extremely helpful to us during this project. Steve Black and Jim Abbott, both knowledgeable burned rock midden aficionados, gave their time to visit our fieldwork in progress and offer advice, and to review the draft of the preliminary summary report and data recovery research design document soon after testing was completed.

Faunal analysis was done by Brian Shaffer, Zooarcheology Laboratory, Institute of Applied Sciences, University of North Texas. Analysis of macrobotanical remains was done by Phil Dering, Paleoethnobotany Laboratory, Center for Ecological Archeology, Texas A&M University. Human skeletal remains from the burial were examined by Joan E. Baker, Department of Anthropology, Texas A&M University. Radiocarbon assays were done by Beta Analytic of Miami, Florida.

INTRODUCTION

Kyle Killian

From May to July 1999, Prewitt and Associates, Inc. (PAI) conducted geomorphic reconnaissance and archeological testing at 41CV413, located on the Clear Creek Golf Course on Fort Hood, Texas (Figure 1). Originally recorded in 1982 and evaluated by researchers from Texas A&M University in 1987, the Fort Hood Cultural Resources Management Program staff considered the site to be eligible for listing on the National Register of Historic Places (NRHP) because it encompassed a large, intact, buried burned rock midden. A significant portion of the site was accidentally damaged in early February 1999 by mechanical tree removal in conjunction with golf course construction activities. Subsurface damage to the site triggered a formal testing project to reassess the cultural deposits for a revised National Register eligibility determination. This report documents the results of those testing investigations.

Herein named the Clear Creek Golf Course site, 41CV413 is located on the alluvial terrace and valley slope/strath terrace on the east side of Clear Creek, approximately 3 km south of the confluence of Clear Creek and House Creek. The latter is a tributary to Cowhouse Creek, which is a tributary of the Leon River. Site 41CV413 is located on the eastern side of the main cantonment area at Fort Hood.

The 1999 investigations consisted of geomorphic and archeological reconnaissance followed by archeological testing of Subarea B, the alluvial terrace of Clear Creek, which contains significant archeological remains, including extensive burned rock midden deposits. Because the strath terrace/slope designated as Subarea A had little or no potential to contain intact archeological deposits

in the thin colluvial sediments, no further work was done in this area. Testing in Subarea B included 19 backhoe trenches and 11 handexcavated test units (ten 1x1-m units and one 0.5x0.5-m unit). Hand excavation was concentrated in the central portion of Subarea B, where the burned rock midden deposits are located; most of the work was done in or near the damaged area. Substantial intact midden and nonmidden archeological remains were encountered. One human burial was found in a backhoe trench, but the in situ portion of the burial was not excavated at the direction of then Cultural Resource Management Program director, Kimball Smith. The disturbed remains were reburied at their original location. Many intact features, several within the matrix of the burned rock midden deposits, were completely or partially excavated. A large sample of artifacts, including 90 diagnostic dart points, was recovered from testing of the midden deposits.

This report is organized into seven chapters and six appendixes that present various aspects of the investigations undertaken at 41CV413. Chapter 2 presents general environmental and archeological background information for Fort Hood and Central Texas, then discusses the research design that guides site testing at Fort Hood. Chapter 3 describes field, laboratory, and analytical methods for National Register eligibility testing; presents the history of archeological work at 41CV413; and summarizes the work accomplished during this project. Chapter 4 summarizes the field investigations and defines site stratigraphy and analysis units. Chapter 5 describes the results of investigations within the burned rock midden deposits, while Chapter 6 details the results of nonmidden investigations. Chapter 7 summarizes testing

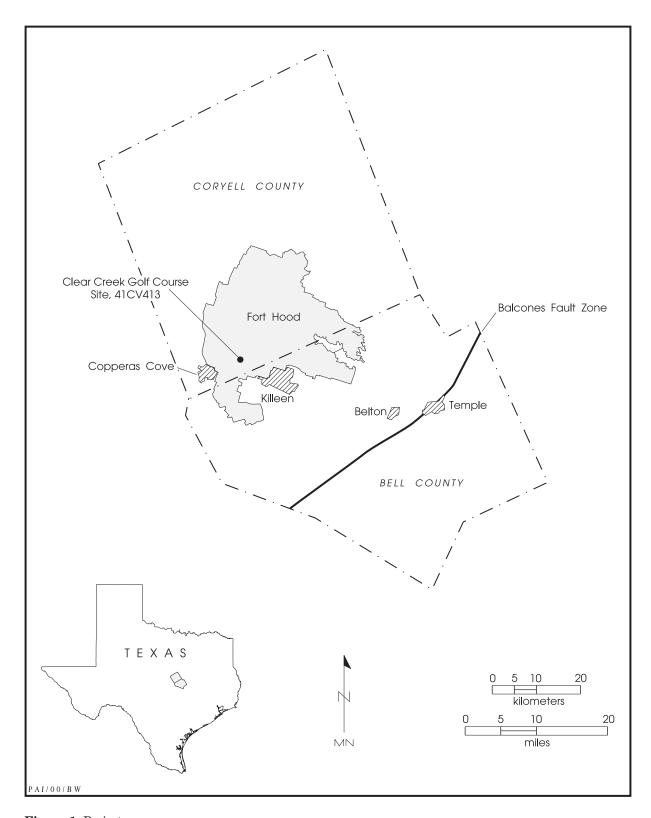


Figure 1. Project area map.

results and presents NRHP assessments and management recommendations.

The appendixes provide a range of technical data. Appendix A presents geological descriptions of selected backhoe trench profiles. An analysis of vertebrate faunal remains by Brian Shaffer (Zooarcheology Laboratory, North Texas State University) is presented in Appendix B. Phil Dering's (Paleoethnobotany Laboratory, Texas A&M University) analysis of macrobotanical remains recovered though flotation is presented in Appendix C. Appendix D presents a limited analysis of human remains

from the burial by Joan Baker (Anthropology Department, Texas A&M University). The provenience of all artifacts is tabulated in Appendix E. Finally, Appendix F is a document entitled Summary of National Register Testing and Data Recovery Research Design for Archeological Investigation of 41CV413, Fort Hood, Texas. Written in June 1999, this document was a preliminary report on the results of the 1999 testing by Prewitt and Associates, along with a proposed research design for data recovery. This document has been slightly modified and is presented in its entirety.

ENVIRONMENTAL AND ARCHEOLOGICAL BACKGROUND

Karl W. Kibler, Gemma Mehalchick, and Douglas K. Boyd

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ENVIRONMENTAL BACKGROUND

Clear Creek is a perennial tributary stream of House Creek that flows across the lower Cretaceous Glen Rose limestone, and its network of tributaries drains ca. 64 km² of lower Cretaceous rocks of the Walnut Formation (Proctor et al. 1970). A complete picture of the fluvial geomorphology of Clear Creek Valley is not available, but limited studies associated with earlier archeological investigations suggest that late Quaternary alluvium underlies three distinct surfaces within the valley (see Mehalchick, Killian et al. 2000; Mehalchick, Kleinbach et al. 2000:95-102; Trierweiler 1996:223-233). The highest alluvial surface (T_2) is underlain by thin deposits of late Pleistocene Jackson alluvium and is usually highly eroded. The intermediate surface (T₁) is 1–3 m above the Clear Creek channel. Along some segments of Clear Creek, the T₁ surface can be divided into two components— T_{1a} and T_{1b} . The T_{1a} terrace consists of Fort Hood alluvium and a drape of West Range alluvium. The T_{1b} terrace is inset to the T_{1a} by an erosional unconformity. Its surface grades to the T_{1a} surface, which is generally ca. 1 m higher. The T_{1b} is comprised of West Range and Ford alluvia. Gravelly point bars of Ford alluvium make up the lowest surface, the T₀. According to Nordt (1992:77), the approximate ages of the named alluvial units on Fort Hood are:

Alluvium	Time of Deposition
Jackson	?–15,000 B.P.
Georgetown	11,000-8000 B.P.
Fort Hood	8000–4800 B.P.
West Range	4300–600 B.P.
Ford	600 B.Ppresent

Soils along Clear Creek belong to the Doss-Real-Krum soils map unit (McCaleb 1985). The lower stream terraces or flood terraces are mantled by dark clayey to loamy Mollisols of the Bosque soils. In the upper portion of the Clear Creek basin, dark clayey Mollisols of the Krum series are more common on the lower stream terraces. Loamy Mollisols of the Lewisville series occupy the higher terrace surfaces (T₂) throughout the valley. The ancient strath terraces and lower valley slopes are mantled by loamy Mollisols and shallow gravelly Mollisols of the Doss and Real soil series, respectively.

Plant communities along Clear Creek include a mix of mid- and tallgrass prairies and riparian zones of hardwood arboreal species (McCaleb 1985:38–40). Pecan (Carya illinoensis), American elm (Ulmus americana), common hackberry (Celtis occidentalis), post oak (Quercus stellata), blackjack oak (Q. marilandica), live oak (Q. fusiformis), cottonwood (Populus spp.), and western soapberry (Sapindus saponaria) occupy the lower stream terraces, with an understory of little bluestem (Schizachyrium scoparium), big bluestem (Andropogon gerardii), indiangrass (Sorghastrum nutans), and switchgrass (Panicum virgatum). Tallgrass prairies occupy the higher stream terraces, while the lower toeslopes of the valley are covered with tall grasses and scattered clusters of Texas live oaks (Q. texana) and junipers (Juniperus ashei). Mid to tall grasses occupy the valley's midslopes.

ARCHEOLOGICAL BACKGROUND

The prehistoric cultural-historical frameworks incorporating discrete temporal and

technological units delineated and defined by Prewitt (1981, 1985), Johnson and Goode (1994), and Collins (1995) have been presented in many Fort Hood reports (see Kleinbach et al. 1999; Mehalchick, Kleinbach et al. 1999, 2000). Although the chronologies of Prewitt (1981, 1985), Johnson and Goode (1994), and Collins (1995) all have merit, the latter is used in this report because it is the most precise in terms of its radiocarbon-dated projectile point sequence. This sequence is briefly summarized here.

The Paleoindian period (11,500–8800 B.P.) represents the earliest known cultural manifestation in North America. Sites and isolated artifacts from this period are fairly common across Central Texas. Recent investigations at the Wilson-Leonard site (41WM235) support the view that Paleoindians used a wide array of subsistence resources and challenges the fundamental defining criteria of the Paleoindian period, that of artifacts in association with late Pleistocene megafauna (Collins 1998; Masson and Collins 1995).

Both Collins (1995) and Johnson and Goode (1994) recognize a period of extreme aridity in Central Texas during the Archaic period, and the intensification of burned rock midden use was possibly in response to these xeric conditions. However, Collins (1995), as well as Nordt et al. (1994) and Toomey et al. (1993), views these xeric conditions as the culmination of a continual decrease in effective moisture since the end of the Pleistocene, while Johnson and Goode (1994) do not

The Archaic period (8800 to 1300–1200 B.P.) is generally believed to represent a shift toward hunting and gathering of a wider array of animal and plant resources and a decrease in group mobility (Willey and Phillips 1958:107–108), although such changes may have been well underway by the beginning of the period. The Archaic is generally subdivided into Early, Middle, and Late subperiods (Black 1989; Collins 1995; Story 1985:28–29).

Early Archaic (8800–6000 B.P.) sites are small, with very diverse tool assemblages (Weir 1976:115–122). This suggests that groups were highly mobile and population densities were low (Prewitt 1985:217). It has been noted that Early Archaic sites are concentrated along the eastern and southern margins of the Edwards Plateau (Johnson and Goode 1994; McKinney 1981). The construction and use of rock hearths, earth

ovens, and small burned rock middens reflect a specialized subsistence strategy (possibly exploitation of roots and tubers) during the Early Archaic. These burned rock features most likely represent the technological predecessors of the larger burned rock middens used extensively later in the Archaic period (Collins 1995:383).

During the Middle Archaic period (6000-4000 B.P.) the number and distribution of sites, as well as site size, may have increased due to probable increases in population densities (Prewitt 1981:73; Weir 1976:124, 135). A shift in the technology of processing plant foods is suggested by the appearance of larger burned rock middens toward the end of the Middle Archaic, although tool kits still imply a strong reliance on hunting (Prewitt 1985:222-226). Johnson and Goode (1994:26) believe that dry conditions promoted the spread of xerophytic plants such as yucca and sotol, and that these plants were collected and cooked in large rock ovens by late Middle Archaic peoples. Other researchers suggest that climate change does not necessarily explain cultural change and caution that correlating climatic and cultural events is tricky for many reasons (Ellis et al. 1995:411-414).

During the succeeding Late Archaic period (4000 to 1300–1200 B.P.), human populations continued to increase (Prewitt 1985:217). The establishment of large cemeteries along major drainages suggests strong territorial ties by certain groups (Story 1985:40). Middle Archaic subsistence technology, including the use of burned rock middens, continued into the Late Archaic period. According to Collins (1995:384), the construction and use of burned rock middens reached a zenith during the Pedernales-Kinney interval and declined during the latter half of the Late Archaic. However, mounting chronological data suggest that midden formation and use culminated much later, during the Ensor-Frio-Fairland and Darl intervals, and that this high level of use continued into the early Late Prehistoric period (Black et al. 1997; Kleinbach et al. 1995:795). That burned rock midden use in the eastern part of Central Texas was prevalent after 2000 B.P. is clear (Black et al. 1997:Figure 133). This scenario parallels the widely recognized occurrence of post-2000 B.P. middens in the western reaches of the Edwards Plateau (see Goode 1991). The use of burned rock middens appears to have been a major part of

the subsistence strategy as a decrease in the importance of hunting, implied by the low ratios of projectile points to other tools in site assemblages, may have occurred (Prewitt 1981:74).

The Late Prehistoric period (ca. 1300–1200 to 300 B.P.) is marked first by the introduction of the bow and arrow into the region and later by the appearance of ceramics. Population densities dropped considerably from their Late Archaic peak (Prewitt 1985:217). Subsistence strategies did not differ greatly from the preceding period, although bison became an important economic resource during the latter part of the Late Prehistoric period (Prewitt 1981:74). The use of burned rock middens for plant food processing continued throughout the Late Prehistoric period (Black et al. 1997; Goode 1991; Kleinbach et al. 1995:795). Horticulture came into play very late in Central Texas and was of minor importance to the overall subsistence strategy (Collins 1995:385).

HISTORY OF ARCHEOLOGICAL INVESTIGATIONS AND DISTURBANCES AT 41CV413

Site 41CV413 is located on the valley slopes and alluvial terraces of Clear Creek in southwestern Coryell County. The site was not cultivated before the U.S. government took the land (1942–1943). A 1938 air photograph indicates that the area was not cleared of vegetation at that time; the terrace was covered with scattered trees with a dense tree canopy along Clear Creek and its tributary. The presence of large trees and identifiable fence lines suggests that livestock grazing was the only agricultural activity that occurred on the site.

At the time the Clear Creek Golf Course was constructed in 1976, no archeological survey had been done and some areas of the site were disturbed (Dr. Cheryl Huckerby, personal communication 1999). The extent of disturbance related to construction appears to have been significant in some areas but minimal in others. A comparison of the modern air photograph and the 1938 air photograph indicates that many trees were probably removed during the initial golf course construction phase, particularly from the fairway that cuts through the northern and eastern portion of the site. A few trees were likely removed from the central portion of the site to

construct the open-area driving range, but none were cleared from the area immediately east of the driving range.

Site 41CV413 was first recorded in 1982 by George Thomas for the Fort Hood Archeological Resources Management Program. Archeologists from Texas A&M University revisited the site in 1987 and recorded additional information. They observed no evidence of military training impacts. The site was reported to consist of "two burned rock mounds, a burned rock scatter, and a lithic scatter" (Ensor 1991:87). No collections were made, but observed artifacts included a dart point fragment. The chronology of the site was not known, and no subsurface testing was done. Noting the high potential for intact buried deposits, however, investigators recommended that the site be considered potentially eligible for listing on the National Register of Historic Places. The site was informally called the "Clear Creek Golf Course Mounds" site by Texas A&M archeologists. Because the site is located on the golf course, it was not subject to damage from regular training activities, and therefore, Fort Hood's cultural resources personnel assumed that it was relatively well protected. Thus, 41CV413 was not slated for National Register testing.

In 1999, construction activities related to additions and renovations of the Clear Creek Golf Course were coordinated with the Fort Hood Archeologist within the Department of Public Works (DPW) and with civilian contractors doing onsite work. The site area was reexamined by Fort Hood archeologists, and the sensitive central area of the site was marked on 1998 air photograph prints. Trees around the perimeter of the area also were flagged, and it was stipulated that no mechanical work was to occur in this area (Dr. Kimball Smith, personal communication 1999). Despite prior coordination with the archeology staff and DPW, a heavy machinery operator working for the construction contractor used a bulldozer to remove trees from the central portion of the site in early February 1999. Because this incident was viewed as a violation of the Archeological Resources Protection Act of 1979 (PL 91-190; 42 USC 4321 et seq.) by the Federal Government, it triggered formal National Register eligibility testing of 41CV413. After this incident, a Fort Hood archeologist conducted a damage assessment, determined that the damage was severe, and made recommendations for NRHP testing (Kleinbach 1999). Fort Hood archeologists mapped the damaged areas of the site on large-scale recent air photographs and noted that 11 percent of the site's surface was disturbed. They estimated that 110 m³ of cultural fill was disturbed by the removal of 25 to 30 trees of various sizes, and that between 640 and 1,280 m³ of sediments containing cultural deposits were disturbed across the alluvial terrace. The latter estimate is based on the observation that between 10 and 20 cm of sediments were disturbed across a 6,439-m² area (Kleinbach 1999; Karl Kleinbach, personal communication 1999).

In April 1999, Prewitt and Associates was contracted to conduct the NRHP testing of the

damaged archeological deposits in the alluvial terraces at 41CV413 (designated as Subarea B). The site was formally named the Clear Creek Golf Course site at that time. Field investigations were conducted in May 1999; in order to expedite consultation between the U.S. Army and Fort Hood and quickly determine the next steps in the management process, a preliminary report summarizing the May 1999 investigations was prepared by Boyd (1999a). This preliminary report, which also included a proposed research design for data recovery at the site, is presented in Appendix F. This volume is the detailed technical report on the May 1999 archeological investigations of Subarea B at 41CV413.

METHODS OF INVESTIGATION AND WORK ACCOMPLISHED

Kyle Killian

This chapter summarizes the methods used and work accomplished during National Register testing at site 41CV413. The archeological research conducted by Prewitt and Associates (PAI) is consistent with the Fort Hood Cultural Resources Management Plan as defined by Jackson (1994) and with previous prehistoric site investigations conducted by TRC Mariah Associates (Mariah) from 1991 to 1995 and by PAI from 1995 to the present.

FIELD METHODS

National Register testing at 41CV413 consisted of a site reconnaissance, backhoe trenching, and manually excavated test units. With the site records and maps made by previous investigators in hand, the project archeologist and project geomorphologist conducted a reconnaissance to reevaluate the site. This reconnaissance had the following goals: to become familiar with the site layout; to define surface features, artifact concentrations, and areas of disturbance; to assess the geomorphic and archeological potential of the site; and to establish subareas if appropriate. Based on geomorphic differences, the site was divided into Subareas A (toeslope and valley wall) and B (alluvial terraces). Subarea A was determined to have a low archeological research potential, and all subsequent work was done in Subarea B.

After the reconnaissance, backhoe trenching was conducted to furnish exposures for interpreting depositional events and to assess site geomorphology, delineate buried cultural deposits, and provide access to buried components warranting manual excavation. The Directorate of Environment and Housing,

Maintenance Division, Pavement Section at Fort Hood provided a backhoe and an extremely proficient operator. The Project Archeologist always accompanied the backhoe operator to monitor the trenching effort. Trench placement was based on the reconnaissance inspection of exposures, past and present investigators' observations (such as cultural materials noted in exposures), and the need for adequate horizontal coverage of the area. All mechanical and manual excavations were conducted within Subarea B.

All backhoe trench locations and dimensions were determined by the Project Archeologist in consultation with the Geomorphologist or the Principal Investigator. Trenches were numbered consecutively, and a wooden datum stake was placed next to the corresponding trench. The Project Archeologist noted trench locations on the site sketch map and recorded standardized information about each trench on a backhoe trench data form. Trench orientation was recorded as the direction of the long axis relative to magnetic north. Trench dimensions (i.e., length, width, and depth) were recorded in meters. The Geomorphologist profiled selected trench walls and described strata on a geologic profile form. In cases where stratigraphic profiles were similar, only one or two trench profiles were recorded. Specific information regarding methods used to describe geologic profiles is found in Appendix A. All trench excavations were monitored, and all trench walls were inspected by field personnel for cultural remains. As a general rule, trench fill was not screened, but 3 m³ of sediment in the vicinity of the burial (Feature 4) was screened through 1/4inch-mesh hardware cloth in order to recover any displaced human remains.

When appropriate, diagnostic artifacts or special samples, such as charcoal and bulk sediment samples, were collected. Each sample was given a unique number consisting of the first letter of the sample type followed by a number (e.g., the first charcoal sample collected from a site was designated C1, the first flotation F1, etc.). All similar types of samples were numbered consecutively and recorded on a sample inventory form.

Test units were excavated to sample buried cultural deposits, to provide exposures for stratigraphic interpretation, and to maximize the sampling of subsurface deposits across the site. The Project Archeologist determined the locations of test units in consultation with the Geomorphologist or the Project Manager. These decisions were contingent upon the trenching results, previous investigators' observations, and a general reinspection of the site area. Because test units were excavated adjacent to backhoe trenches, each unit's orientation corresponds to that of the adjacent trench. Test units generally measured 1x1 m, with two exceptions. Test units were numbered sequentially, and all were excavated in arbitrary 10-cm levels, with the ground surface at the highest corner of each unit used as the datum for elevation control. In cases where test units were excavated on the safety benches of backhoe trenches or overburden was intentionally removed, excavation levels were numbered from the modern ground surface (e.g., the first level might be 110-120 cm).

Hand-excavated fill was dry screened through 1/4-inch-mesh hardware cloth. If present, samples of charcoal and land snail shells were collected from each general level context. Due to the quantity of cultural materials encountered in the general midden matrix, not all materials were collected. As a control sample, all cultural materials in selected units were collected and burned rocks were sorted by size, counted, and weighed. These units were selected arbitrarily to serve as samples of the general midden deposits. In other test units, only diagnostic specimens (e.g., dart points) and easily recognizable formal stone tools were collected, and unmodified debitage and burned rocks were not collected or quantified. It is estimated that collection of all unmodified debitage from these midden deposits would have produced between 10,000 and 25,000 flakes (at 500 to 1,000 flakes per level) in poorly defined archeological

contexts. Many researchers have commented on the contextual problems inherent in general midden matrices (e.g., Black et al. 1997:307–314, 1998:217–228; Ellis et al. 1994:58–63; Hester 1991; Nickels et al. 1998:134–135). Unmodified mussel shell fragments lacking hinges, along with intrusive historic and modern items, were never collected, but their presence was noted. As a result of the golf course construction, some portions of Subarea B were capped with between 5 and 25 cm of topsoil and sod. In most cases, these upper levels were removed as overburden without being screened. However, a sample of these upper sediments was screened in Test Unit 2.

An excavation record form was completed for each level of each test unit, and an artifact frequency distribution summary form and an inventory of field bags were filled out for every test unit. Selected profiles of test units, particularly those revealing features or cultural lenses in cross section, were drawn.

Features were typically excavated and removed as discrete provenience units, while nonfeature matrix surrounding features was removed according to arbitrary levels and screened separately. Exceptions include midden deposits (i.e., Features 1, 2, and 3), which were completely excavated in arbitrary 10-cm levels. A feature data form was completed for each feature, and plan and profile views were drawn. Whenever possible, separate charcoal samples were taken from the feature fill. In many cases, all of a feature's matrix was removed as a flotation sample. The size of individual flotation samples was contingent on feature size and the type of fill. If only a portion of the feature was sampled, the remaining matrix was screened through 1/4-inch-mesh hardware cloth. When special samples, such as flotation or charcoal, were taken from features, they were assigned specific sample numbers and listed on sample inventories. The Project Archeologist noted test unit locations on the site sketch map and recorded all excavations in progress on daily journal forms. When necessary, a general data form was used for recording additional excavation information or daily notes.

Test units were generally excavated until deposits that were not culturally relevant (e.g., the thick gravel substrate) were encountered. Test Unit 2 was terminated immediately when a burial was observed in the backhoe trench profile below the test unit.

All excavations were photographed and videotaped. Black-and-white print and color slide photographs were taken to document all phases of the investigations, including site and area overviews, backhoe trench and test unit excavations and profiles, cultural features, and other unusual archeological remains. Additional documentation was provided by video recording of the work in progress and at completion of site testing.

The entire site was mapped using a Sokkia electronic total station, but mapping concentrated on Subarea B. A permanent site datum, marked by a metal cap set in mortar, was established and assigned an arbitrary elevation of 100 m. Topographic data for the site is relative to this datum point. The site map includes the natural topography, cultural features visible on the surface, all mechanical and manual excavations, natural and manmade landmarks, and site and subarea boundaries based on the known or suspected spatial limits of surface or buried deposits. A subsurface map was made of the midden profile exposed in Backhoe Trench 2.

During the course of the test excavations, records and maps were reviewed by the Project Archeologist for consistency and quality. Records were periodically reviewed by the Project Manager and the Quality Control Officer.

The final field task consisted of backfilling all test excavations. Each backhoe trench and all test units were filled in by the backhoe. An archeologist accompanied the operator and monitored the process.

Upon completion of the fieldwork, a preliminary site summary report was written and submitted, along with corresponding attachments and videotape, to the Cultural Resource Management Program Director at Fort Hood.

LABORATORY METHODS

Before fieldwork began, a thorough review was made of the methods and standards required by the Fort Hood Cultural Resources Management Program for laboratory processing and curation of collections. All artifacts, materials and samples, and project records also complied with federal curation guidelines, Council of Texas Archeologists' standards, and current curation and conservation standards. A laboratory manual created during previous phases of work outlined the procedures to be

used and standards to be met (Prewitt and Associates, Inc. 1995).

All collections were organized, processed, and curated by provenience. As artifacts and samples were brought in from the field, they were organized by provenience and checked against the inventory of field bags and the sample inventory form completed in the field to detect any problems or inconsistencies with the provenience information. If a problem was noted, it was corrected by referring to other excavation records or by consulting with the Project Archeologist. Collection bags were checked for special information or instructions, and these materials were handled accordingly.

Once field bags were checked, the materials were taken to the wet lab for cleaning. Some artifact categories, such as bone, charcoal, and vegetal matter, were finger- or dry-brushed rather that cleaned with water. Other artifacts were cleaned using tap water and occasionally a soft toothbrush. After cleaning, artifacts were placed on a drying rack and allowed to thoroughly air dry before being cataloged.

For some lithic materials, it was necessary to remove calcareous deposits that would hinder analysis. This was done using a 5 percent solution of hydrochloric acid in water. If necessary, the artifact was soaked for 10 minutes in clear tap water and then soaked in the HCl solution until most of the effervescence ceased. The artifact was then soaked in clear tap water for at least 30 minutes to remove any remaining acid from the lithic surface. A list of artifacts that received this treatment is included in the project records.

After cleaning, the artifacts were bagged by material type within provenience designation. Each group of provenienced artifacts was assigned a unique, provenience-specific accession number. A specimen inventory organized in accession number order was compiled, with each artifact type listed under its assigned accession number. Information recorded on the specimen inventory consists of the accession number, associated provenience data, the name of the excavator(s), the date of excavation, any other information recorded on the field bag, and the type and quantity of artifacts recovered. For some material categories, such as charcoal, a weight (usually in grams) was recorded rather than a count.

All categories of artifacts were cataloged with the site and accession numbers. Lithic tools

were assigned unique specimen numbers within each accession number. When assigned, this number was added after the accession number on the artifact. Each artifact received a base coat of PVA (a 10 percent solution of Polyvinyl Acetate Resin-AYAT in acetone). When dry, the site, accession, and specimen numbers were recorded on the artifact using a rapidograph pen. This catalog number was then covered with a top coat of PVA.

Each artifact type was placed into a 4-mil polyethylene bag. Archival curation tags documenting the name of the project, project number and date, site number, provenience data, accession number, artifact type, and the number of specimens (or weight) were placed into 1.5-mil polyethylene bags and placed within each artifact bag. Artifacts were grouped by artifact types or subtypes if appropriate. For example, projectile points were bagged by type name rather than as one unit.

Flotation samples were processed using the Flote-Tech flotation system, which provides a multimodal method of separating materials in a sediment sample. The process resulted in a light fraction that was used for special analyses (such as macrobotanical) and a heavy fraction that was checked for artifacts and faunal remains. Roots and unmodified rocks were removed and discarded. Any artifacts found in flotation samples were processed following the procedures outlined above.

All photographs were keyed to a photo log identifying the subject, direction of view, date, and photographer. Black-and-white photographs and negatives were checked against the photo logs to ensure that frame numbers and captions correlated and that the recorded information was accurate. The contact sheets were labeled on the back with project, site, photo, roll, and frame numbers. The negatives were labeled with project, site, and photo numbers. A 4x5-inch print was made from each black-and-white negative; these also were labeled with project, site, and photo numbers, as well as a caption. Color slides were checked against the photo log to ensure that the frame numbers and captions correlated and that the recorded information was accurate. Each slide was labeled with project name and number, site number, slide number, and caption. All of the photographic materials were placed into appropriate archival holders. Videotapes of site investigations were labeled

with project name and number, site number, and appropriate provenience information.

All forms and records used in the field and the lab were printed on archival paper and filled out in pencil. The exceptions were maps drawn on nonarchival grid paper; these were later treated in the lab with a deacidification solution. All field, lab, and analysis records were organized by project and then by site. Records were grouped by categories such as daily journal notes, testing forms, feature forms, specimen inventories, and so on. The only exception is that all photographs were curated as a unit, with all of the black-and-white negatives and prints together and all of the color slides together. All written and photographic materials were placed in archival folders, archival record boxes, and archival curation boxes. An inventory detailing contents was included with each curation box. Curated photographic records also contain a computer-generated copy of the photo log, a cross-referenced photo log, and a disk copy of the computerized photo logs.

ANALYTICAL METHODS

Analyses of material culture varied considerably depending upon the class of artifacts being analyzed, the number of specimens within each artifact class, and specific goals of the analysis. The material culture classification scheme employed during this analysis is outlined in Table 1. Artifacts were grouped first by type of material; then within each material group, artifacts were further classified into morphological-functional classes and subclasses. Systematic observations of selected attributes were made for different classes of artifacts. Within each class, each specimen was analyzed individually, and its specific attribute data were recorded on a computer coding form and entered into the computer database (see Data Manipulation below). The detailed attributes recorded for stone artifacts, the most abundant artifact type recovered, are summarized in Table 2. For smaller artifact classes, such as modified bones or shells, specimens are described individually and detailed attributes were not recorded in the database.

The remainder of this section defines the various artifact classes and subclasses, attributes recorded for stone artifacts, and methods of manipulating the material culture data.

Table 1. Classification of material culture

CHIPPED STONES CHIPPED STONES, continued Unmodified debitage Dart points named types GROUND AND BATTERED STONES untyped Manos untypeable fragments Metates Perforators Bifaces BURNED ROCKS early/middle stage late stage/finished FAUNAL REMAINS knives Vertebrate miscellaneous bifaces modified bones Unifaces unmodified bones end scrapers side scrapers ▼ Invertebrate modified shells end/side scrapers unmodified shells miscellaneous unifaces Edge-modified flakes MACROBOTANICAL REMAINS

Attributes recorded for all nonlithic artifacts are described in the appropriate material culture sections of Chapters 5 and 6.

• Cores

Definitions of Artifact Classes

The artifact classification and attribute analysis systems are the same as those used by PAI for the 1996 season prehistoric site testing (Kleinbach et al. 1999:Table 5). They also generally correspond with the artifact analyses previously conducted by TRC Mariah (Abbott and Trierweiler 1995a:56-68; Trierweiler 1996:54-63) and with general morphological descriptions of chipped and ground stone artifacts by Turner and Hester (1993). In this analysis, more emphasis is placed on simple morphological groupings of artifacts rather than on inferring tool function derived from detailed analyses of flaking technology and use wear. This streamlined approach is justifiable given the limited artifact sample size from 41CV413 and the inherent limitations of behavioral interpretations that may be derived from artifact assemblages from general midden contexts.

Chipped Stone Artifacts

Dart point is a functional grouping that denotes stone artifacts probably used to tip darts or spears propelled with an atlatl (spear thrower). They are generally characterized as bifacially flaked specimens with triangular to leaf-shaped blade sections, sharply pointed distal ends, and sharp lateral blade edges. When possible, dart points were further classified by named types defined in archeological literature. Specimens that could not be assigned to a named type are classified as either untyped (complete or nearly complete points that do not conform to any specific type) or untypeable (fragments of dart points too incom-

plete to be typed). All projectile points were assigned to types by Elton Prewitt.

Preforms represent a late stage of projectile point manufacture, where production ceased before fully diagnostic attributes developed. The stem and notches of the one specimen in this category were already apparent, and thinning of the blade had begun. However, manufacture was abandoned during thinning because of recurring step fractures.

Perforators are characterized as having relatively long and tapered projecting bits with diamond-shaped biconvex or planoconvex transverse cross sections. They generally exhibit use-related microflaking on both faces of each edge or on alternate faces of opposite edges; polish and rounding are often evident on the blades as well. The bases of perforators may be unmodified flakes, unifaces, bifaces, or projectile points reworked into perforators. As a functional group, perforators are thought to have been used primarily for drilling or poking holes through various materials. No distinction is made between fine-tipped perforators, commonly called drills, and broad-tipped specimens, often called reamers.

Bifaces include all varieties of bifacially flaked tools that are not included in other classes. Bifaces from 41CV413 are grouped into four subclasses used in the same manner as defined by Mariah (Abbott and Trierweiler

Table 2. Summary of attributes recorded for stone artifacts

		Unmodified	Chipped	Ground
Attributes	Dart Points	Debitage	Stone Tools	Stone Tools
Site number, accession (lot) number,				
and provenience data*	X	X	X	X
Type name	X			
Tool class or subclass	X		X	X
Raw material	X	X	X	X
Chert type	X	X	X	
Completeness	X	X	X	X
Cortex**		X	X	
Patination**	X	X	X	
Heated**	X	X	X	X
Size (by groups)		X		
Maximum length (mm)	X		X	X
Maximum width (mm)			X	X
Maximum thickness (mm)	X		X	X
Blade length (mm)	X			
Blade width (mm)	X			
Haft length (mm)	X			
Neck width (mm)	X			
Base width (mm)	X			
Comments***	X	X	X	X

^{*} Provenience data recorded include backhoe trench or test unit number, excavation level, elevation or centimeters below surface (for piece-plotted specimens), feature association, flotation sample number, surface collection, etc.

1995a:60–61; Trierweiler 1996:56–57): (1) early/ middle-stage bifaces; (2) late-stage/finished bifaces; (3) bifacial knives; and (4) miscellaneous bifaces. The first two subclasses represent different stages of the biface reduction sequence recognized by Callahan (1979), Collins (1975), Sharrock (1966), and others. Early/middle-stage bifaces approximate Callahan's Stages 2 and 3, Collins's initial trimming into primary trimming, and Sharrock's Stages 1 and 2. They have moderate to considerable amounts of cortex remaining and may have isolated knots resulting from inadequate flake removals. The edges are irregular and exhibit no clear central plane when viewed on end. Late-stage/finished bifaces approximate Callahan's Stages 4 and 5, Collins's primary trimming into secondary trimming, and Sharrock's Stages 3 and 4. They are characterized by few or no remnants of cortex, sinuous to straight edges centered on a longitudinal plane when viewed on end, and a well-defined outline shape. Some of the Fort Hood late-stage/

finished bifaces conform to named types of tools, such as the Friday, Guadalupe, or San Gabriel bifaces described by Turner and Hester (1993:253, 256–258, 273). Finished bifaces generally have a clear ovate to triangular outline shape. Bifacial knives are thin bifaces that are triangular in shape and exhibit retouch or sharpening on the blades and edge grinding or haft wear on the proximal end. The miscellaneous biface subclass is a catchall group that includes bifacially worked specimens too fragmentary or too irregular to be classified as early/middle-stage or late-stage/finished bifaces. Miscellaneous bifaces may include specimens that functioned as scrapers or knives, or in other capacities.

Unifacial specimens are classified into four subclasses: (1) end scrapers, (2) side scrapers, (3) end-side scrapers, and (4) miscellaneous unifaces. These subclasses are recognized by the morphology and location of unifacial retouch or use wear relative to the flake on which the tool is made. End scrapers have significant retouch

^{**} Presence and absence or degree of this trait were noted.

^{***} Comments field was used for additional observations.

or use wear along their distal edges, side scrapers have one or more worked or worn lateral edges, and combination end-side scrapers have characteristics of both. These scrapers, particularly end scrapers, may exhibit evidence of hafting in the form of scarring or polishing on ventral ridges or proximal lateral edges. Miscellaneous uniface is the catchall group for any unifacial tool that does not fit into another subclass. Miscellaneous unifaces include specimens that are irregularly shaped or have minimal unifacial working and retouch.

Edge-modified flakes have one or more edges that exhibit very minimal retouch or use wear. These expedient tools were used with little or no preparation. Edge-modified flakes include tools that some lithic analysts call utilized flakes or minimally retouched flakes.

A core is a chipped stone that has had flakes removed, but its primary function was as a source of flakes. Cores exhibit no evidence of use, and the original intent was to remove flakes suitable for producing tools.

Unmodified debitage consists of flakes that exhibit no evidence of having been further modified or used. For analytical purposes, unmodified flakes were classified as complete, proximal fragments, chips (medial or distal fragments), and chunks (angular fragments). The amount of cortex present on flakes was recorded (see below), but no attempt was made to define flakes according to their inferred reduction stage (such as biface thinning flakes, notching flakes, or unifacial manufacture/ resharpening flakes). Before coding attributes, unmodified flakes also were sorted into the following size categories corresponding to standard-sized sieves: <0.25 inch, 0.25-0.5 inch, 0.5–1.0 inch, 1.0–1.5 inches, 1.5–2.0 inches, and >2.0 inches.

Ground and Battered Stone Artifacts

Ground and battered stone tools are classified into manos and metates. Manos are stones used for grinding and generally have one or two ground faces (i.e., unifacial or bifacial grinding). Metates are milling slabs on which manos were used; they encompass a range of different forms and sizes. Most metates were fractured, and some were found in contexts that suggest secondary use (e.g., as hearthstones).

Burned Rocks

Burned rock is a category that includes all nonchert rocks (primarily limestone) exhibiting evidence of heating such as thermal discoloration, angular fractures, or spalling. Thermally altered rocks encountered in hand excavations were examined and quantified in the field (i.e., sorted by size and weighed) and then discarded if no other modifications were observed. Some burned rocks were directly associated with heating/cooking features, within or outside the midden, while the majority were associated with general midden deposits. All of these burned rocks are considered to have been heated intentionally and were probably used as heatretaining stones in a heating/cooking feature at one time or numerous times.

Faunal Remains

Faunal remains include vertebrate and invertebrate remains and are classified as unmodified or modified. Vertebrate faunal remains are identified and discussed in detail in Appendix B. Depending upon their archeological context and other factors, unmodified bones are considered to represent either discarded remains of animals that were killed by humans or remains deposited as a result of natural processes. These specimens exhibit no evidence of intentional modification, but may include bones modified incidentally or accidentally by humans (e.g., bones that exhibit spiral fractures or cut marks resulting from butchering an animal). A detailed analysis of all unmodified bones is presented in Appendix B.

Modified bones are specimens intentionally cut, ground, or otherwise altered in the process of manufacturing a tool or ornament. This category may also include specimens that exhibit use wear and were used as expedient tools.

Invertebrate faunal remains include land snail shells and freshwater mussel shells. Snail shells, primarily various species of *Rabdotus*, are ubiquitous in cultural deposits at Fort Hood but are believed to occur naturally in most contexts; organic-rich detritus in habitation sites likely attracted the snails. Consequently, the presence and abundance of snail shells was always noted in excavation records, but only a small sample was collected from any given provenience for possible radiocarbon dating or

amino acid racemization studies. Mussel shell valves and fragments were also present in cultural zones at 41CV413, and these are thought to represent materials introduced by humans. Although most shells found in archeological contexts are thought to represent the discarded by-products of eating mussels, some shells were modified to make tools and ornaments. All unmodified mussel shell valves with an umbo (whole or partial) were collected; other fragments were discarded in the field. Mussel valves or shell fragments with evidence of intentional modification, such as cut edges or drilled holes, were collected and are considered to be artifacts. Discolored or calcined shells indicate that shells were heated intentionally, perhaps to open shells to remove the mussels, or burned accidentally, possibly being discarded into fires.

Macrobotanical Remains

Samples of macrobotanical remains, primarily charred wood recovered from flotation samples, were identified when possible. The presence, absence, or abundance of macrobotanical remains is discussed for individual features (see Chapters 5 and 6). A detailed analysis of macrobotanical remains from selected sites is presented in Appendix C.

Definitions of Stone Artifact Attributes

Aside from provenience data and classification attributes, other attributes recorded for stone artifacts consist of subjective observations and objective measurements of metric data. Subjective attributes include identifications of raw materials and chert types and assessments of artifact completeness, presence or absence of cortex and patination, and evidence of heating. Objective (i.e., metric) attributes consist of measurements (in millimeters) used to characterize individual specimens. When appropriate, comments regarding nonstandard attributes or observations for individual specimens were added to the database.

Raw Materials and Chert Types

Raw material types commonly identified among the chipped, battered, and ground stone artifacts are chert, quartz, and limestone. Specimens identified as chert consist of opaque to partially translucent cryptocrystalline or microcrystalline materials. Fine-grained cherts lack visible crystalline structure, have weak to moderate luster, and are partially translucent; coarse-grained cherts have visible crystalline structure, an opaque appearance, and a generally grainy fill. All chert specimens, regardless of artifact class, were compared with the established Fort Hood chert typology (Table 3). Due to the importance of Central Texas as a chert resource area for local and extraregional use (Shafer 1993:55), much attention has been devoted to developing a typology of the chert resources on Fort Hood (Abbott and Trierweiler 1995b; Dickens 1993a, 1993b; Frederick and Ringstaff 1994. Trierweiler (1994) presents an especially detailed chert typology. One specimen of quartz, an unmodified flake, was encountered. Various types of Cretaceous limestones (carbonate-rich, fine-grained sedimentary rocks) are the most abundant rocks found in cultural deposits at Fort Hood (see Burned Rocks). No attempt was made in the field or laboratory to identify different types of limestones, although the presence of fossils was often noted.

Completeness

Each stone artifact is described as complete, nearly complete, proximal fragment, medial fragment, distal fragment, edge fragment, indeterminate fragment, or barb. For incomplete specimens, no attempt was made to interpret the nature of the breakage (manufacture vs. use breaks).

Cortex

The amount of cortex present on a chipped stone artifact provides evidence of the raw material source and can reveal much about the stage of manufacture. Cortex on each chipped stone artifact was recorded as 0 percent, 0–50 percent, 50–99 percent, or 100 percent. No attempt was made to describe different types of cortex.

Patination

The degree of patination on chert artifacts was noted as being none, light, or heavy. Patination is the complex weathering process by which cherts develop a colored rind around

Table 3. Fort Hood chert types

Type Number	Type Name	Abbreviation
1	Heiner Lake Blue-Light	HLB-LT
2	Cowhouse White	CW
3	Anderson Mountain Gray	AMG
4	Seven Mile Mountain Novaculite	SMN
5	Texas Novaculite	TN
6	Heiner Lake Tan	HLT
7	Fossiliferous Pale Brown	FPB
8	Fort Hood Yellow	FHY
9	Heiner Lake Translucent Brown	HLTB
10	Heiner Lake Blue	HLB
11	East Range Flat	ERF
13*	East Range Flecked	ER FLECKED
14	Fort Hood Gray	FHG
15	Gray-Brown-Green	GBG
16	Leona Park	$_{ m LP}$
17	Owl Creek Black	OCB
18	Cowhouse Two Tone	CTT
19	Cowhouse Dark Gray	CDG
20	Cowhouse Shell Hash	CSH
21	Cowhouse Light Gray	CLG
22	Cowhouse Mottled with Flecks	\mathbf{CMF}
23	Cowhouse Banded and Mottled	CBM
24	Cowhouse Fossiliferous Light Brown	CFLB
25	Cowhouse Brown Flecked	CBF
26	Cowhouse Streaked	CS
$\frac{1}{27}$	Cowhouse Novaculite	CN
28	Table Rock Flat	TRF
29	indeterminate white	
30	indeterminate yellow	_
31	indeterminate mottled	_
32	indeterminate light gray	_
33	indeterminate dark gray	_
34	indeterminate light brown	_
35	indeterminate dark brown	_
36	indeterminate dark brown indeterminate black	_
30 37	indeterminate black	_
38	indeterminate blue	_
39	indeterminate red indeterminate nonlocal	_
*No Type	12 was assigned.	

their exterior surfaces. With respect to Central Texas cherts, Frederick et al. (1994:6) use the term patina to refer to the weathering rind that is visible in petrographic thin sections and is "white or light gray to the unaided eye." Patination is a time-dependent process and can be used in a gross fashion as an age indicator, although different types of chert patinate at different rates in different depositional environments, and the absence of patination

says nothing about an artifact's age. There are too many variables involved in the chemical process of patination to derive meaningful chronological interpretations based on variations in the degree of patina.

Heating

Artifacts that exhibit evidence of low- to moderate-intensity heating, such as slight discoloration, reddening, and a glossy surface texture, may have been intentionally heat treated. In cases where artifacts were intensively heated, as evidenced by heat spalling, fracturing, or crazing, it is likely that the heating was accidental. However, distinguishing between intentional and accidental heating is subjective. For this analysis, degree of heating was recorded as none, low, or high for all stone artifacts. Chert specimens that show evidence of low- to moderateintensity heating may represent intentionally heattreated pieces.

Metric Attributes

For most stone tools, the only measurements taken were maximum length, width, and thickness. For

projectile points, the standard measurements taken were maximum length, blade length, blade width, haft width, neck width, base width, and maximum thickness. All measurements were taken in millimeters with digital calipers and read to one-tenth of a millimeter.

Data Manipulation

After artifact data was put onto coding

sheets, they were entered into a database for manipulation. The software used to code and analyze the data is ACCESS for OFFICE 97.

WORK ACCOMPLISHED

Geomorphic reconnaissance was conducted on 11 May 1999 to assess the archeological potential of 41CV413. Based on differing geomorphic context and archeological potential, 41CV413 was divided into two subareas. Subarea A consists of a strath terrace and lower valley toeslope (Killeen surface) resting on bedrock and mantled by thin late Holocene deposits. These late Holocene deposits had been heavily damaged by golf course construction. Because the potential for intact stratified cultural deposits was negligible, no further management was warranted for Subarea A.

Subarea B encompasses the alluvial terrace on the east side of Clear Creek, comprised of the upper T_{1a} and lower T_{1b} surfaces. Extensive cultural materials, including burned rocks and lithic artifacts, were observed on the surface and in recently disturbed portions of the site. Also, cutbank exposures and exposures caused by uprooted trees indicated that significant amounts of buried cultural materials were present in Subarea B. Because Subarea B had a high potential to contain stratigraphically discrete buried archeological deposits, subsurface testing was conducted to determine National Register eligibility.

On 12–13 May, a series of backhoe trenches were excavated in Subarea B (Figure 2 and Table 4). Decisions about the location, length, and depth of each backhoe trench were made by the Project Archeologist or Project Geomorphologist. Primary considerations were the need for spatial coverage of the subarea, the desire to get maximum exposures of stratigraphic units and midden features, and safety. Some of the shallow backhoe trenches were terminated when extensive gravel deposits were encountered.

Fifteen trenches (Backhoe Trenches 1–11, 14, 16, 18, and 19) were excavated on the T_{1a} surface. Cultural deposits—primarily burned rocks—were encountered in many of these trenches. Eleven test units also were excavated in this portion of Subarea B (Table 5). A total of 6.59 m³ of fill was hand excavated. Recovery of cultural materials from nonmidden contexts was low, but as many as 1,000 flakes per 10-cm level

were recovered from some parts of the midden. The most significant archeological information can be derived from the midden feature(s), internal features within the midden matrix, and features in nonmidden contexts.

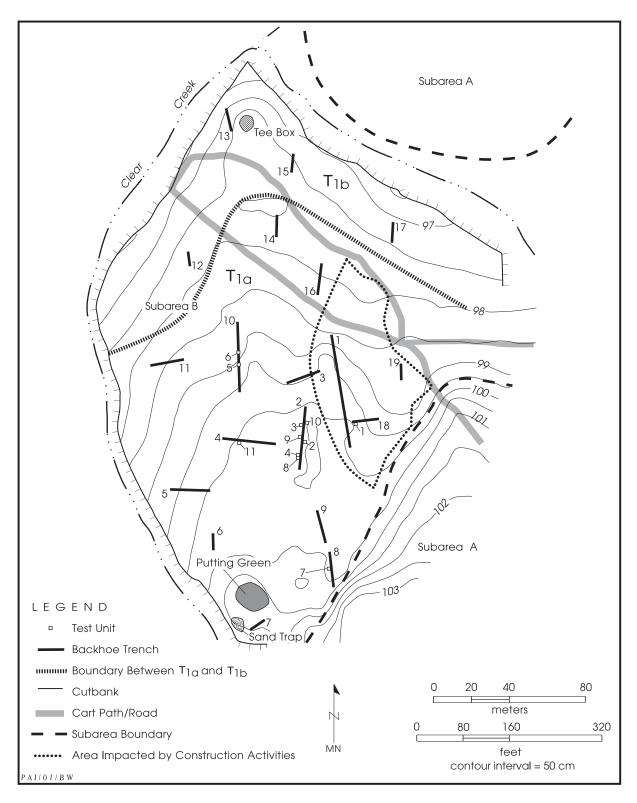
The T_{1b} terrace is located in the northern end of Subarea B and along a tributary drainage that enters Clear Creek at the north end of the site. Backhoe Trenches 12, 13, 15, and 17 were excavated on this surface. No cultural materials were encountered, and no hand excavation was done.

Eleven cultural features were identified at 41CV413 (Table 6), but Features 1 and 2 are probably parts of the same large midden. It is possible that Feature 3 also is part of this same midden, although this is less certain. The large midden covers at least 40x40 m and could be 60x60 m or larger. The longest and best exposure is found in Backhoe Trench 2, where the midden was further sampled in Test Units 2–4, 8, and 9. It rests directly on a gravel facies that caps fine-grained deposits interpreted as Fort Hood alluvium.

Features 6 and 9 are basin-shaped hearths or remnants of earth ovens within the large midden. Feature 8 is an ash dump also located within the midden. The other features are from nonmidden areas. Features 5 and 10 are basin-shaped hearths, and Feature 11 is a nonmidden burned rock concentration. Feature 7 is an occupation zone.

Feature 4 is a human burial found at ca. 78-107 cm, below the midden deposits. Backhoe Trench 2 disturbed a portion of the burial, but based on exposures in the floor and east wall of the trench, over half of the burial remained intact. Approximately 3 m³ of fill removed by the backhoe was screened through 1/4-inch-mesh hardware to recover all of the human remains. As directed by then Fort Hood Cultural Resources Management Program Director, Kimball Smith, after consultation with the Tonkawa Tribe, the disturbed remains were taken to the CRM office at Fort Hood where they were examined and inventoried by an osteologist (see Appendix D). The disturbed remains were reinterred with the remaining part of the burial on 3 June 1999. All backhoe trenches and test units at 41CV413 were backfilled on 4 June 1999.

Charred wood (and possible charred seeds) were recovered from 13 of 38 sediment samples



 $\textbf{Figure 2.} \ \, \textbf{Site map of } 41\text{CV} 413 \ showing locations of impacted area, backhoe trenches, and hand excavated test units.}$

Table 4. Summary of backhoe trenches at 41CV413

Backhoe	D: .	
Trench	Dimensions	Cultural Materials Observed
1	47.0x0.8x1.5 m	Feature 1 present from the surface to a maximum depth of 60 cm, extending ca. 40 m in trench walls
2	23.5x0.8x1.5 m	Features 4, 6, and 8 exposed in trench walls; Feature 2 present from 15 to $20~\rm cm$ to a maximum depth of 90 cm, extending the length of the trench
3	13.0x0.8x0.7 m	scattered burned rocks in the A horizon (ca. 50 cm thick)
4	23.0x.0.8x1.2 m	Feature 2 present from 30 to 90 cm, extending the length of the trench but thinning to the west
5	15.0x0.8x1.5 m	Feature 3 present from 10 to 20 cm to a maximum depth of 60 cm, extending 13 m west from the east end of the trench
6	6.5x0.8x0.8 m	scattered burned rocks in the A horizon, south end of the trench
7	6.0x0.8x1.2 m	few burned rocks
8	14.0x0.8x2.3 m	Feature 11 and associated scattered burned rocks
9	14.0x0.8x2.5 m	occasional burned rocks
10	23.0x1.5x3.6 m	burned rock lens at the south end of the trench at $45-50~\rm cm$, extending ca. $7~\rm m$ north in both walls; Feature 5; buried soil at ca. $150~\rm cm$
11	14.0x0.8x1.6 m	none observed
12	5.0x0.8x0.8 m	none observed
13	9.5x1.5x3.0 m	none observed
14	8.0x0.8x2.0 m	none observed
15	7.0x0.8x1.9 m	none observed
16	11.0x0.8x1.6 m	burned rocks at 60 and 120 cm
17	6.5 x 0.8 x 2.1 m	none observed
18	11.0x0.8x1.7 m	Feature 1 present from the surface to a maximum depth of 60 cm, extending the length of the trench; Feature 7 exposed in south wall
19	6.0x0.8x1.4 m	none observed

taken for flotation from various contexts (Table 7). The majority of samples yielding charred remains were from general midden matrix and hearth features. The flotation recovery is

sufficient to yield materials for radiocarbon dating, but the samples of macrobotanical remains are sparse and their interpretability is limited (see Appendix C).

Table 5. Summary of test units at 41CV413

Test Unit	Unit Size	Depth of Excavation	Volume of Hand Excavation (m ³)	Collection Strategy
1	1x1 m	1–20 cm	1.20	complete
2	1x1 m	0–30 cm	0.30	complete
3	1x1 m 1x1m 0.5x0.5 m	0–20 cm removed as overburden 20–90 cm 90–110 cm	- 0.70 0.05	none complete complete
4	1x1 m 1x1m	0–17 cm removed as overburden 17–90 cm	- 0.73	none complete
5	1x1 m 1x1 m	0–80 cm removed as overburden 80–115 cm	- 0.30	none complete
6	0.5x0.5 m 0.5x0.5 m	0–102 cm removed as overburden 102–110 cm	0.02	none complete
7	1x1 m 1x1 m	0–93 cm removed as overburden 93–110 cm	- 0.17	none complete
8	1x1 m 1x1 m	0–15 cm removed as overburden 15–87 cm	- 0.72	none selective
9	1x1 m 1x1 m	$0-25~\mathrm{cm}$ removed as overburden $25-90~\mathrm{cm}$	_ 0.65	none selective
10	1x1 m 1x1 m	0–20 cm removed as overburden 20–90 cm	_ 0.70	none selective
11	1x1 m 1x1 m	0–20 cm removed as overburden 20–125 cm	- 1.05	none selective
Total Volume	e of Hand-Excava	ated Fill	6.59	

Collection strategy:

 $complete = all \ fill \ screened \ and \ all \ artifacts \ and \ cultural \ materials \ collected.$

none = all fill discarded without screening; nothing collected.

selective = all fill screened but only temporally diagnostic artifacts and formal tools collected.

Table 6. Summary of features at 41CV413

Enghana	E4	Backhoe	Mark III. ika	Depth Below
Feature	Feature Type	Trenches	Test Units	Surface (cm)
1*	burned rock midden	1, 18	1	0–60
2*	burned rock midden	2, 3, 4, 10	2, 3, 4, 8, 9, 10, 11	15–90
3*	burned rock midden	5	_	10–60
4**	human burial	2	_	78–107
5	basin-shaped hearth	10	5	85–117
6***	basin-shaped hearth	2	3	45–76
7	occupation zone	18	1	77–115
8***	ash dump	2	9	59–70
9***	basin-shaped hearth	2	4, 8	64–93
10	basin-shaped hearth	4	11	108–125
11	burned rock concentration	8	7	97–105

 $^{^{*}}$ Features 1, 2, and 3 may all be the same midden deposit.

^{**} Feature 4 may be stratigraphically associated with Feature 2.

^{***} Features 6, 8, and 9 are internal features within Feature 2.

Table 7. Summary of flotation materials recovered from 41CV413

Table 1. Du	minary of mor	rable is buildingly of moravous materials recovered in the vital						
				Analyzed Materials	[aterials]			Total
Flotation Sample	Feature Association	Provenience	Microdebitage	Microfauna	Charred Wood	Charred Seeds or Nuts	Total Sample Volume (cups)	Sample Volume (liters)
1	1	Test Unit 1 $(20-30 \text{ cm})$	×	×	×		31	7.44
2	1	Test Unit 1 $(30-40 \text{ cm})$	X	×			25	00.9
က	2	Test Unit 3 (30–40 cm)	×	×	×		34	8.16
4	2	Test Unit $3 (40-50 cm)$	×	×	×		34	8.16
ರ	1	Test Unit 1 $(40-50 \text{ cm})$	×	×	×		24	5.76
9	rc	Test Unit 5 (100–110 cm)	×		×		42	10.08
7	2	Test Unit $3 (50-60 \text{ cm})$	X	×	×		38	9.12
%	9	Test Unit $3 (50-60 \text{ cm})$	×	×	×		53	12.72
6	none	Test Unit 1 $(60-70 \text{ cm})$	X	×	×		32	7.68
10	C 1	Test Unit 4 $(40-50 \text{ cm})$	×	×			26	6.24
11	none	Test Unit 1 (70–80 cm)	×	×			37	8.88
12	5	Test Unit 5 $(100-110 \text{ cm})$	×				27	6.48
13	2	Test Unit $4 (50-60 \text{ cm})$	×	×			32	7.68
14	7	Test Unit 1 $(80-90 \text{ cm})$	×	×	×		39	9.36
15	9	Test Unit $3 (60-80 \text{ cm})$	×	×			214	51.36
16	none	Test Unit 6 (100–110 cm)	×				55	13.20
17	2	Test Unit 4 (60–70 cm)	×	×	×		26	6.24
18	7	Test Unit 1 (90 -100 cm)	X	×			31	7.44
19	2	Test Unit 4 (70–80 cm)	X	×	×	×	27	6.48
20	*9	Test Unit 3 (63–74 cm)	×	×	×	×	13	3.12
21	9	Test Unit 3 (48–64 cm)	×	×	×		51	12.24
22	9	Test Unit $3 (52-67 \text{ cm})$	×	×	×		22	5.28
23	7	Test Unit 1 $(77-108 \text{ cm})$	×	×	×		102	24.48
24	11	Test Unit 7 ($97-105 \text{ cm}$)		×			46	11.04
25	9	Test Unit $3 (72-80 \text{ cm})$	×	×			24	5.76
* Matrix i	is from below th	Matrix is from below the metate in Feature 6.						
	Sample 21 is not assigned	1ed.						

²³

RESULTS OF INVESTIGATIONS: SITE STRATIGRAPHY AND DEFINITION OF ANALYSIS UNITS

Karl W. Kibler and Gemma Mehalchick

4

The geoarcheological site data in this chapter includes an overview of the Clear Creek drainage basin and a detailed description of selected backhoe trench profiles and site stratigraphy of Subarea B at 41CV413 (see Appendix A). This is followed by a definition of analysis units based on the results of the excavations.

SEDIMENTS AND STRATIGRAPHY

Site 41CV413 is located along a meander of Clear Creek, a perennial tributary stream of House Creek that flows across the lower Cretaceous Glen Rose limestone. Clear Creek's network of tributaries drains ca. 64 km² of lower Cretaceous rocks of the Walnut Formation (Proctor et al. 1970). Two geomorphic surfaces or landforms are present within the boundaries of 41CV413 (Figure 3). The higher surface (Subarea A) is ca. 6-7 m above the Clear Creek channel and represents a strath terrace or ancient erosional surface resting on the Glen Rose limestone. This gently sloping to level surface is mantled by a thin (<1 m) gravelly loam, but this probable late Holocene sheetwash deposit has been heavily affected and modified by the golf course. Soils imprinted on this sheetwash mantle consist of shallow Typic Calciustolls of the Doss and Real series (McCaleb 1985). At 41CV413, this surface forms the margins of the Holocene Clear Creek valley overlooking the lower geomorphic surface.

The lower surface (Subarea B) consists of a constructional surface, a Holocene alluvial terrace (T_1) . The soils of the T_1 terrace are mapped as thermic Cumulic Haplustolls of the Bosque series (McCaleb 1985). This nearly level

 T_1 terrace is subdivided into T_{1a} and T_{1b} components. A sharp boundary or topographic scarp separating the two surfaces is difficult to discern, as the T_{1a} surface gently grades down to the T_{1b} surface. The terrace is comprised primarily of the Fort Hood and West Range alluvial units, with a thin veneer of Ford alluvium in some places (Nordt 1992). The Ford deposits are a minor component and are difficult to separate from the West Range alluvium.

The T_{1a} surface extends back to the valley wall and stands ca. 4 m above the Clear Creek channel. The alluvial fill below the T_{1a} surface consists of Fort Hood channel fill (point bar and chute-modified point bar) and floodplain facies. These deposits were examined in detail in three backhoe trenches (Backhoe Trenches 1, 8, and 10) excavated on the T_{1a} surface (see Appendix A). The 126-cm-thick profile of Backhoe Trench 1 reveals an upward-fining channel fill. Pedogenically, the profile displays an A-Bw-C soil. The basal deposits (49-126+ cm), comprising the Bw and Chorizons, are very gravelly, comprised of rounded and poorly sorted clasts with the interstices filled by the infiltration of more-fine-grained sediments from later depositional episodes. The upper deposit (0-49 cm) has been anthropogenically altered and may also consist of a thin drape of West Range alluvium. This deposit is a black silty clay loam with a mix of burned rocks from the burned rock midden designated as Feature 1.

The profile of Backhoe Trench 8 revealed Fort Hood-aged channel fill (point bar) and floodplain facies. An upward-fining channel fill overlying a floodplain deposit was observed at the northern end of the trench. Pedogenically, this profile exhibits an A-2Ab-2Bwb-2BCb-3Btb soil. The basal floodplain deposit (157–240+ cm)

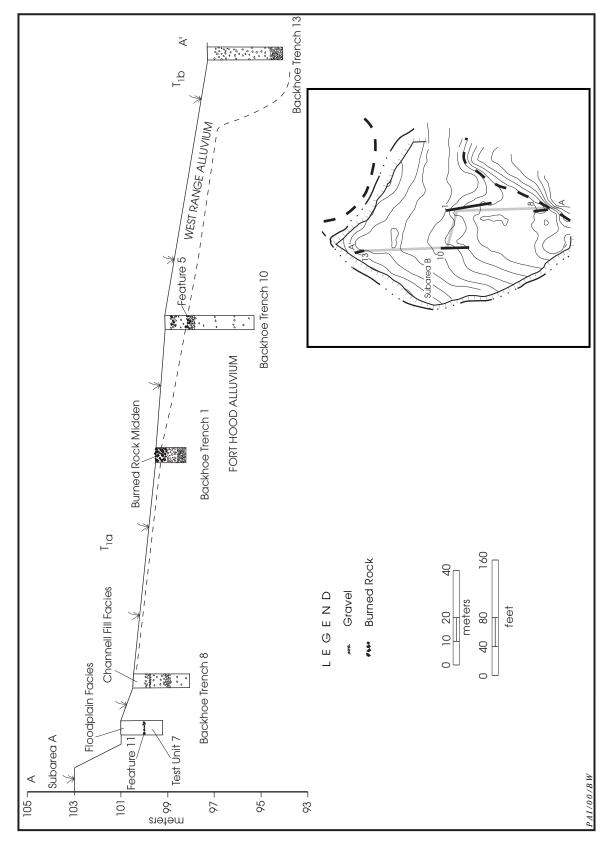


Figure 3. Generalized cross section of Subarea B at 41CV413. The ephemeral Ford alluvial deposits are not shown.

is a brown clay imprinted with a truncated 3Btb soil horizon. Truncation of this soil occurred when the Clear Creek channel shifted and subsequently deposited an upward-fining fill at this locality. The overlying point bar (70–157 cm) consists of well-sorted subrounded gravels that fine upward to a brown sandy clay loam. An 11cm-thick bed of moderately sorted subrounded gravels representing a gravel-filled chute tops the point bar. A second gravelly channel fill (54-70 cm) overlies the chute-modified point bar. The sequence continues to fine upward to a very dark gray clay loam (34-54 cm) upon which a 2Ab horizon formed. This soil was buried by a very dark grayish brown clay loam drape of West Range alluvium (0–34 cm).

The channel fill facies in the northern end of Backhoe Trench 8 are bound by or associated with floodplain facies in the southern end of the trench. The 177-cm-thick profile of Fort Hood alluvium observed at this locality displays an AC-2Ab-2Bwb-2Btb soil. The AC horizon (0–24 cm) represents a capping artificial fill, presumably sod laid down for the golf course. The buried soil (24–177+ cm) has formed on very dark gray and brown silty clay loams, clay loams, and clays.

The profile of Backhoe Trench 10 displays Fort Hood-aged (and possibly West Range) channel fill and floodplain facies. A 21-cm-thick artificial fill capping the deposits appears to be sod laid down for the golf course. Pedogenically, this profile exhibits an AC-Ab-Bwb-Bwkb-2Akb-2Btkb-2Cb soil. Floodplain facies (154–379+ cm) consist of silty clay and clay loams. This deposit is pedogenically altered, displaying a dark grayish brown 2Akb horizon and yellowish brown 2Btkb horizon. These floodplain sediments are overlain by an upward-coarsening sequence of channel fill sediments (21–154 cm). The sediments consist of a sandy clay loam that grades to a gravelly sandy clay loam and gravelly clay loam of Fort Hood and possibly West Range age. This sequence of deposits exhibits an Ab-Bwb-Bwkb soil profile.

The T_{1b} terrace comprises a narrow surface that lies adjacent to and 2–3 m above the Clear Creek channel. Alluvial fill below this surface consists of channel fill and floodplain facies; it is laterally inset to the Fort Hood alluvium of the T_{1a} terrace and laps onto the T_{1a} surface. These deposits were examined in detail in Backhoe Trenches 13 and 15 (see Appendix A).

The profile of Backhoe Trench 13 reveals an upward-fining channel fill (point bar). The basal deposit (268–320+ cm) is comprised of clast-supported rounded gravels. Overlying the gravels (84–268 cm) is a very dark grayish brown to dark grayish brown sandy clay loam with common dispersed matrix-supported rounded gravels (probable gravel stringers that have since been displaced or disturbed). A very dark gray to dark gray clay loam (0–84 cm) caps the sequence. It is believed that these sediments represent the West Range and possibly Ford alluvial units. They display an A-AB-Bw-C-C2 soil profile.

Floodplain and channel fill facies were observed in Backhoe Trench 15. The basal deposit (161–175+ cm) consists of poorly sorted, clast-supported, rounded gravels. Floodplain sediments (51-161 cm) consisting of a very dark grayish brown and dark grayish brown clay loam overlie the basal gravel. These sediments are imprinted with a 2Ab-2Bwb soil profile. Both facies are believed to represent the West Range alluvial unit. The soil is buried by a brown gravelly mud (33–51 cm) that probably represents a gravel-filled chute deposited during a flood event. The gravelly mud deposit underlies a second floodplain deposit (0-33 cm) of very dark gray clay and black clay loam. A cumulic A-AB soil profile formed on these sediments is believed to be correlative to the Ford alluvium.

The lower T₁ surface at 41CV413, Subarea B formed throughout the Holocene. The construction of this surface appears to have begun during the early Holocene as the Fort Hood alluvium was deposited by a meandering fluvial system. Based on the positions of the Fort Hood channel fill facies, the T₁ terrace accreted in a general west-northwesterly direction across the valley. Nordt (1992) estimates that the Fort Hood alluviation ceased ca. 4800 B.P., at which time the T_{1a} surface stabilized (though periodic inundation occurred based on the presence of a thin drape of West Range sediments on the T_{1a} surface) and was available for use by prehistoric peoples. Intensive human activities produced a thick anthropogenic mantle on parts of this surface. The surficial exposure of gravelly Fort Hood channel fills provided hunters and gatherers with an endless supply of easily available limestone rocks for constructing hearths and baking pits, which ultimately lead to the formation of burned rock midden(s) at the

site throughout the late Holocene. The use of stabilized gravelly Fort Hood alluvial terraces and subsequent burned rock midden formation throughout the late Holocene has been documented elsewhere at Fort Hood (e.g., Kleinbach et al. 1999:262–268; Trierweiler 1996:223–233).

After stabilization of the $T_{\rm 1a}$ surface, and contemporary with the occupations there, the alluvial fill comprising the $T_{\rm 1b}$ was deposited. The West Range and Ford alluvium aggraded in a similar meandering fluvial system. The lap of West Range sediments onto the $T_{\rm 1a}$ surface provided a means of burial for portions of the site.

DEFINITION OF ANALYSIS UNITS

As defined herein, an analysis unit is a group of artifacts or features that represent a discrete set of cultural activities from a specified time period. An analysis unit has horizontal and vertical limits that are defined based on geomorphic, stratigraphic, and contextual evidence. The temporal span of an analysis unit is based on a combination of absolute and relative chronological evidence.

Analysis Units 1 and 2 contain intact, subsurface cultural deposits and surface artifacts that are associated with specific deposits or features. A small group of artifacts is defined as unassigned collections because they cannot be confidently assigned to either analysis unit. A total of 4,318 artifacts were recovered (see Chapter 3 for details on the artifact sampling strategy), as summarized in Table 8. Provenience data for all collected artifacts are presented in Appendix E.

Unassigned Collections

These artifacts consist of general surface collections that have no feature association, in addition to the cultural materials found from 0 to 30 cm in Test Unit 2. The latter represent materials from a layer of imported sod that caps the midden matrix, apparently in an area where fill was added when the golf course was originally constructed. The surface collections are comprised of a dart point preform and three dart points: an Andice (with ground stem edges and base), a Castroville, and a Pedernales (Figure 4). The dart point preform is a complete specimen. Though several step and hinge fractures are apparent on both surfaces, one face

exhibiting patterned thinning flake scars is less pronounced; nonetheless, this resulted in a thick midsection (14.7 mm) and curvature of the artifact at its distal end. The dart points consist of one nearly complete artifact and two proximal fragments. Table 9 classifies the three dart points and lists their metric attributes and assigned chert type. In Test Unit 2, a total of 14 flakes and 10 burned rocks (2 kg) were found from the surface to 30 cm.

Analysis Unit 1

Analysis Unit 1 corresponds to all of the burned rock midden deposits (Features 1–3), including four discrete, internal features consisting of one burial pit (Feature 4), two basin-shaped hearths (Features 6 and 9), and one ash dump (Feature 8). These are encapsulated in anthropogenically modified West Range-Fort Hood alluvium and encompass an area of approximately 130 m northeast-southwest by 70 m northwest-southeast based on subsurface exposures and surface evidence (Figure 5). Although separate feature numbers were assigned to midden deposits exposed in various trenches, Features 1-3 may represent one laterally extensive midden accumulation, as no definitive breaks in burned rock density were noted. Midden deposits were encountered in Backhoe Trenches 1–5, 10, and 18, and may be present in the intervening areas. Cultural materials, and particularly burned rocks, were not as dense in Backhoe Trench 3 and at the southern end of Backhoe Trench 10; the proximity of these trenches to midden deposits revealed in nearby trenches suggests that these less-concentrated deposits represent the margins of the midden or areas of less intensive use. Excavations reveal that Features 1-3 occur between the surface and a maximum depth of 95 cm. The midden deposits are generally between 45 and 75 cm thick. Seven test units sampled Features 1 and 2, while an eighth (Test Unit 2) was terminated at 30 cm due to the presence of a burial pit (see Chapter 5). Table 10 summarizes the burned rock midden deposits that comprise Analysis Unit 1.

All four internal features (Features 4, 6, 8, and 9) are associated with Feature 2 and are found in or originate from the bottom half of the midden. The ash dump (Feature 8) and two hearths (Features 6 and 9) rest near or just

Table 8. Summary of artifacts recovered by analysis unit

	Unassigned			
Artifacts	Collections	Analysis Unit 1	Analysis Unit 2	Totals
Dart Points	3	91	5	99
Dart Point Preform	1	_	_	1
Perforators	_	2	_	2
Early- to Middle-stage Bifaces	_	5	1	6
Late-stage to Finished Bifaces	_	16	_	16
Bifacial Knife	_	1	_	1
Miscellaneous Bifaces	_	18	_	18
End Scrapers	_	2	_	2
End/Side Scraper	_	1	_	1
Miscellaneous Unifaces	_	8	_	8
Edge-modified Flakes	_	23	2	25
Unmodified Debitage	14	3,821*	289	4,124
Core	_	1	_	1
Mano	_	1	_	1
Metate	_	11	_	11
Modified Bones	_	1	_	1
Modified Shell	_	1	_	1
Totals	18	4,003	297	4,318

^{*} This number does not represent actual numbers of specimens in all test units. Unmodified debitage from general midden deposits was collected only from selected test units (see Chapter 3).



Figure 4. Artifacts from unassigned collections.

below the base of the midden, whereas the burial pit (Feature 4) intrudes into the underlying, nonmidden matrix. Features 6 and 9 yielded charcoal radiocarbon ages of 2510 ± 40 B.P. (Beta-138812) and 3510 ± 50 B.P. (Beta-138813), respectively (Table 11). These dates, along with most diagnostic artifacts, indicate that repeated occupations occurred during the Late Archaic period. Although most of the midden probably accreted at this time, temporally older dart points and stratigraphic evidence suggest that the midden may have originally formed during the Middle Archaic period. Notably, however, several of the earlier

Table 9. Classification, metric attributes, and chert types for dart points from unassigned collections

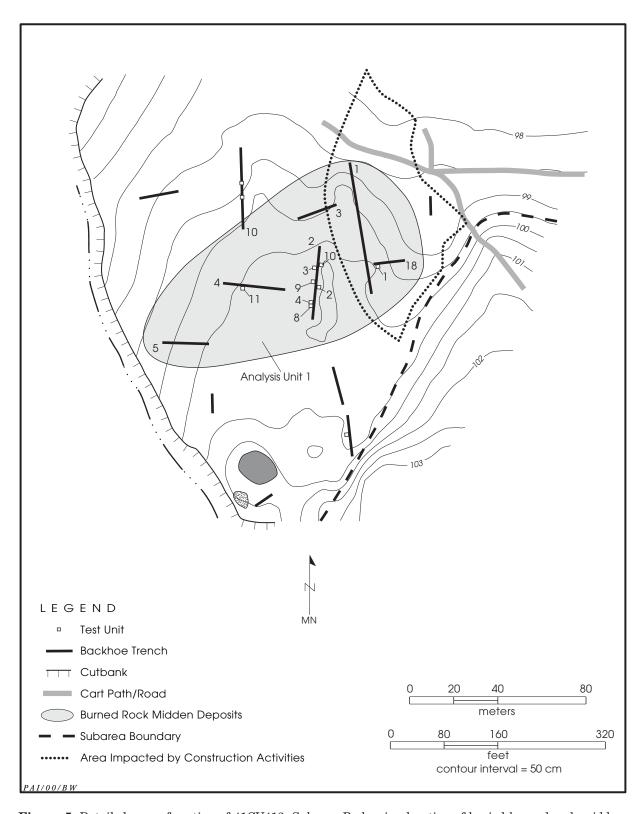
Point	Provenience	Maximum Length	Blade Length	Blade Width	Haft Length	Neck Width	Base Width	Maximum Thickness	Chert Type
Andice	surface	36.4	_	_	22.9	18.1	19.4	8.1	Owl Creek Black
Castroville	surface	53.7	41.8	34.7	11.9	22.8	_	6.9	indeterminate light brown
Pedernales	surface	50.9	-	-	20.5	15.3	17.3	8.2	Heiner Lake Translucent Brown

NOTE: All measurements are in millimeters.

points attributed to Analysis Unit 1 (e.g., one Wells, one Provisional Type I, and one Nolan) are reworked and may have been used by later inhabitants.

Analysis Unit 2

Analysis Unit 2 encompasses the prehistoric cultural materials buried in Fort Hood alluvium beneath or away from the midden features. Although nonmidden deposits are present to a maximum depth of 3.6 m (in Backhoe Trench 10), isolable cultural components were encountered between ca. 70 and 130 cm. These occupations are represented by two hearths (Features 5 and 10), an occupation zone (Feature 7), and one burned rock concentration (Feature 11). Obtained from Features 7 and 5, charcoal radiocarbon ages of 4180 \pm 50 B.P. (Beta-138811) and 5080 \pm 50 B.P. (Beta-139806) indicate use of the area during the Middle Archaic period (see Table 11).



 $\textbf{Figure 5.} \ \ \text{Detailed map of portion of 41CV413, Subarea B showing location of buried burned rock midden deposits comprising Analysis Unit 1. }$

 $\begin{tabular}{ll} Table 10. Summary of Analysis Unit 1 burned rock midden exposures in test units and backhoe trenches \end{tabular}$

Feature	Test Unit	Backhoe Trench	Depth (cm)	Thickness (cm)
1	1	18	0–60	60
2	2^*	2	24-30+	7+
2	3	2	20 – 95	75
2	4	2	17–80	63
2	8	2	15-70	55
2	9	2	25 - 75	45
2	10	2	20-90	70
2	11	4	40-90	50
3	_	5	0–60	50

^{*} Test Unit 2 excavation was halted at 30 cm when a burial was discovered in the bottom of the trench below the midden.

Table 11. Summary of radiocarbon dates associated with Analysis Units 1 and 2

Beta Sample	Analysis Unit	Analysis Unit Sample Provenience	Feature Association	Feature Association Dated Material	Conventional Age B.P.	$^{13}\mathrm{C}/^{12}\mathrm{C}$ Ratio	INTERCAL 98 Radiocarbon Age Calibrations by Beta Analytic, 2-sigma Range
None assigned	ı	Test Unit 5 (103 cm)	ರ	charred material	not dated; insufficient carbon	I	
Beta-138811	23	Test Unit 1 (93 cm)	7	charred material	4180 ± 50	(-25.3)	2895–2590 B.C.
Beta-138812	1	Test Unit 3 $(62-76 \text{ cm})$	9	charred material	2510 ± 40	(-25.2)	795–500/465–425 B.C.
Beta-138813	1	Test Unit 8 $(79-87 \text{ cm})$	6	charred material	3510 ± 50	(-25.5)	1955-1700 B.C.
Beta-139806	2	Test Unit 5 (98 cm)	2	charred material	5080 ± 50	(-25.5)	3975-3765 B.C.

RESULTS OF INVESTIGATIONS: MIDDEN DEPOSITS

Gemma Mehalchick 5

This chapter presents results of the excavations in the midden deposits defined as Analysis Unit 1 (see Chapter 4) and interpretations of the prehistoric occupations contained therein. Seven backhoe trenches and eight test units encountered midden deposits comprised of Features 1, 2, and 3. Four separable, internal features were also encountered within the Feature 2 midden deposits.

CULTURAL FEATURES

Features 1, 2, and 3

Test Units 1, 3, and 4 recovered complete samples of general midden matrix. From these three units, all artifacts and faunal remains were collected, and burned rocks were counted and weighed. The results of these excavations are presented first.

In Test Unit 1, Feature 1, a burned rock midden, was present from the surface to 60 cm. The unit contained dense burned rocks (n = 1,403;600.75 kg). Other cultural materials consisted of 5 stone tools (including 1 Pedernales dart point), 168 flakes, 32 unmodified bones (primarily Vertebrata), and 2 unmodified mussel shells (Table 12). None of the bones exhibited spiral fractures. Only 10 burned rocks were larger than 15 cm in maximum length, and most (n = 1,010;72 percent) were found to a depth of 10-40 cm (Table 13). Two flotation samples produced carbonized *Quercus* sp. and indeterminate wood; a third sample did not contain charred plant remains (see Appendix C).

In Test Unit 3, Feature 2, also a burned rock midden, was present from 20 to 95 cm (Figure 6). Again, the matrix was dominated by burned rocks (n = 1,816; 258 kg), but also

vielded 1 Castroville, 1 Frio, and 1 Nolan dart point, 4 untyped dart points, 5 bifaces, 356 pieces of debitage, 109 unmodified bones, and 1 unmodified mussel shell. Most bones (n = 103; 94.5 percent) consisted of Vertebrata and Mammalia; however, Artiodactyla, Leporidae, Testudinata, and Lepus and Sylvilagus spp. were represented. Only 18 bones (16.5 percent) were spirally fractured. One medium to large Mammalia bone fragment exhibited an impact fracture. Three flotation samples yielded charred Quercus sp., Planatus occidentalis, and an indeterminate wood (see Appendix C). Almost 70 percent (n = 1,253) of the burned rocks were found from 20 to 50 cm and above Feature 6, an internal basin-shaped hearth (see below).

Encountered from 17 to 80 cm in Test Unit 4, Feature 2 midden deposits yielded 658 burned rocks (308.75 kg) and 3,361 cultural items. The cultural materials were comprised of 71 stone artifacts, including 17 dart points (Table 14), 2,915 flakes, 1 core, 373 unmodified bones, and 1 unmodified mussel shell. Artiodactyla, Rodentia, Serpentes, Testudinata, and Lepus, Odocoileus, and Syvilagus spp. were represented, as well as Vertebrata and Mammalia (n = 354; 95 percent). Approximately 34 percent (n = 128) of the faunal assemblage exhibits spiral fractures. About 58 percent of the cultural materials were encountered from 20 to 40 cm, and 63.7 percent of the burned rocks were present at 40-60 cm. As with the other two test units, only a small number (n = 14) of burned rocks were larger than 15 cm in size. Two of four flotation samples did not contain carbonized macrobotanical remains: the other two produced charred indeterminate wood and a charred oak acorn fragment (see Appendix C).

Table 12. Summary of cultural materials from Analysis Unit 1, Features 1 and 2, Test Units 1, 3, and 4*	tural mater	ials from /	Analysis L	Init 1, Fe	atures 1	and 2, Te	est Units	1, 3, and	**			
m Provenience	atnio4 trsQ	Early- to Middle- stage Bifaces	ot estage to Finished Bifaces	Miscellaneous Bifaces	End Scrapers	suoənsiləsiM SəssiinU	Edge-modified Flakes	Sores	Unmodified Debitage	Unmodified Bones	bəñibomnU slləd2 ləssuM	alstoT
TEST UNIT 1												
Feature 1 (0–10 cm)	I	I	I	I	I	I	I	I	4	I	I	4
Feature 1 (10–20 cm)	I	I	I	I	I	I	I	ı	44	I	I	44
Feeting 1 (90_30 cm)									93	α		21
reacure 1 (20-00 cm)	I	l	İ	l	l	l	I	l	21	٠ ;	l	10
Feature 1 $(30-40 \text{ cm})$	I	I	I	1	I	I	I	I	သ	13	I	18
Feature 1 (40–50 cm)	1	7	I	I	ı	I	I	I	51	9	2	62
Feature 1 (50–60 cm)	I	I	I	I	I	ı	2	I	41	ಬ	I	48
Subtotals	1	2	0	0	0	0	2	0	168	32	7	207
TEST UNIT 3												
Feature 2 $(20-30 \text{ cm})$	က	1	1	I	I	ı	I	I	114	1	I	120
Feature 2 (30–40 cm)	_	I	I	c:	ı	I	I	I	94	39	I	137
Feature 9 (40_50 cm)	٠.	I	ı) I	ı	ı	I	ı	7 6	, c;	I	107
Fosture $9 (50-60 \text{ cm})$	1	ļ	I	ı	ı	ļ	I	ı	9.	37	I	י ע
Feature 2 (30–00 cm)									177	# 5		8 5
Feature $Z(12-80 \text{ cm})$	(I	I	I	I	I	I	I	19	(I	19
Feature $2 (80-90 \text{ cm})$	21	ļ	I	1	I	I	I	I	35	21	I	36
Feature 2 (90–95 cm)	I	I	ı	ı	ı	ı	ı	ı	က	I		4
Subtotals	7	1	1	က	0	0	0	0	356	109	1	478
TEST UNIT 4												
Feature 2 $(17-20 \text{ cm})$	2	I	က	ı	1	1	4	I	190	П	I	201
Feature 2 $(20-30 \text{ cm})$	4	1	П	2	I	1	9	I	1,017	25	I	1,060
Feature 2 $(30-40 \text{ cm})$	9	I	5	4	1	က	4	П	839	30	1	893
Feature 2 $(40-50 \text{ cm})$	4	I	က	4	1	1	70	I	375	55	I	447
Feature 2 $(50-60 \text{ cm})$	1	I	1	I	ı	ı	I	ı	335	100	I	437
Feature 2 $(60-70 \text{ cm})$	I	I	1	1	1	1	1	I	86	88	1	187
Feature 2 (70–80 cm)	I	I	I	I	I	I	1	I	61	74	I	136
Subtotals	17	1	13	13	1	9	20	1	2,915	373	1	3,361
TOTALS	25	4	14	16	1	9	22	1	3,439	514	4	4,046
							1					

* Cultural items from Level 3 (24–30 cm) of Test Unit 2 are associated with Feature 2 but are not included in this table. The 140 specimens consist of 1 miscellaneous uniface, 134 unmodified flakes, and 5 unmodified bones.

Table 13. Summary of burned rocks from Analysis Unit 1, Features 1 and 2, Test Units 1, 3, and 4

	Burned	Burned Rock
Provenience	Rock Count	Weight (kg)
TEST UNIT 1		
Feature 1 (0–10 cm)	121	47.75
Feature 1 (10–20 cm)	375	146.00
Feature 1 (20–30 cm)	273	125.00
Feature 1 (30–40 cm)	362	142.50
Feature 1 (40–50 cm)	190	97.00
Feature 1 (50–60 cm)	82	42.50
Subtotals	1,403	600.75
TEST UNIT 3		
Feature 2 (20–30 cm)	341	39.50
Feature 2 (30–40 cm)	456	59.00
Feature 2 (40–50 cm)	456	70.50
Feature 2 (50–60 cm)	226	39.00
Feature 2 (72–80 cm)	147	18.50
Feature 2 (80–90 cm)	163	28.50
Feature 2 (90–95 cm)	27	3.00
Subtotals	1,816	258.00
TEST UNIT 4		
Feature 2 (17–20 cm)	6	6.00
Feature 2 (20–30 cm)	17	13.00
Feature 2 (30–40 cm)	75	34.00
Feature $2 (40-50 \text{ cm})$	172	83.75
Feature $2 (50-60 \text{ cm})$	247	61.50
Feature $2 (60-70 \text{ cm})$	105	80.50
Feature 2 (70–80 cm)	36	30.00
Subtotals	658	308.75
TOTALS	3,877	1,167.50

^{*} Test Unit 2, Level 3 (24–30 cm) contained 93 burned rocks (37.75 kg) associated with Feature 2 but not contained in this table.

Test Unit 2 only sampled the upper 6 cm of Feature 2, from 24 to 30 cm, due to the presence of a burial pit (see Feature 4 below). As the test unit was being excavated, human bones were discovered in the bottom of Backhoe Trench 2 and in the east trench wall below the test unit. Excavation of Test Unit 2 was immediately terminated and never resumed. The 6-cm level produced 1 miscellaneous uniface, 134 flakes, 8 unmodified Vertebrata and Mammalia bones, and 93 burned rocks (37.75 kg).

Four additional excavations (Test Units 8–11) sampled midden deposits designated as Feature 2, but only temporally diagnostic artifacts, formal tools, and faunal remains

were collected from the midden matrix. Expedient flake tools and unmodified debitage were not collected, but some flakes were recovered from flotation samples. Present between 15 and 90 cm in Test Units 8-11, 36 stone tools, 14 flakes, 2 metate fragments, 296 unmodified bones, and 8 unmodified mussel shells were recovered from Feature 2 (Table 15). The collected stone tools include 28 dart points (Table 16) and a perforator that is a recycled corner tang knife. Approximately 85 percent (n = 253) of the bones consist of Vertebrata and Mammalia, but the following were also identified: Aves, Emydidae, Testudinata, Artiodactyla, Leporidae, and Rodentia, and species of *Odocoileus*, Lepus, and Neotoma. Slightly more than one-third of the bones exhibit spiral fractures. One flotation sample from Test Unit 8 yielded charred Quercus sp. wood (see Appendix C).

Additional collections from Feature 1 and 2 midden deposits consist of artifacts recovered in situ from a trench wall, surface-collected artifacts, and those found in backdirt piles that obviously represented midden debris. Dart points collected from such contexts consist of 1 Bulverde, 1 Castroville, 5 Darl, 1 Edgewood, 1 Ensor, 1 Frio, 1 Marshall, 2 Nolan, 14 Pedernales, 1 Provisional Type 1, 2 Wells, 1 Zephyr, 4 untyped, and 2 untypeable points. Other artifacts consist of 1 miscellaneous biface, 1 mano, 7 metate fragments, and 1 modified mussel shell.

Burned rock midden deposits exposed in Backhoe Trench 5 were designated as Feature 3, but no hand testing was done. The top of the midden was only 10-20 cm below the surface and was capped by artificial fill (i.e., golf course sod). The midden deposits extended 15 m east-west (throughout the trench) and were exposed in the north and south trench walls. The midden was 40 cm thick in the east end of the trench, thinning to 20 cm in the west end. It is not known whether Feature 3 represents a separate midden or an extension of the larger midden (i.e., Features 1 and 2). A single artifact, an end-side scraper, was collected from sediment near the top of the midden (ca. 10–20 cm).



Figure 6. Photograph of Feature 2 in the north wall of Test Unit 3; view is north. The unit extends from the surface to 110 cm; Feature 2 is present from 20 to 95 cm. The unit opens into Backhoe Trench 2 on the right.

Feature 4

Feature 4, a human burial, was encountered in the east wall and bottom of Backhoe Trench 2. The feature was first observed when the east wall of Trench 2 was cleaned in order to draw a profile of Feature 2 at the location where Test Unit 2 was being excavated (Figure 7). The upper levels of the test unit were discarded because the sediments were artificial fill brought in during construction of the golf course. The unit was only 4-6 cm into the upper part of the Feature 2 midden deposits when the burial was encountered and the excavation was halted (at 30 cm). The burial pit was present from 78 to 107 cm in the east trench wall. Although the top of the pit could not be discerned, it appeared to intrude from the lower portion of the midden into the underlying and culturally sterile sediment. In contrast to the surrounding light brown gravelly silty clay loam, the pit fill was a

homogenous dark brown silty clay loam with occasional small limestone inclusions. The edges of the pit below the midden were easily defined in the trench wall and in the floor of the backhoe trench. The trench had cut through the western portion of the pit, which measured 45 cm eastwest by 40 cm north-south in the bottom of the trench. Several large, unburned limestone rocks exposed along the lower edges of the pit may have been intentionally placed. When the burial was encountered, Fort Hood Cultural Resource Management Program Director Kimball Smith was notified immediately. The intact portion of the burial was examined, and plan and profile views were drawn. The feature was not excavated.

Because no further excavations were conducted, the overall dimensions of the burial pit are not known, but its shape and configuration in plan and profile suggest that more than half of the burial remained intact. Due to

Table 14. Summary of dart points from Analysis Unit 1, Feature 2, Test Unit 4

Provenience	Almagre	Castroville	Ellis	Marcos	Montell	Pedernales	Untypeable	Totals
Level 2 (17–20 cm)	_	_	_	_	_	_	2	2
Level 3 (20-30 cm)	_	_	1	2	_	_	1	4
Level 4 (30-40 cm)	_	1	_	_	1	2	2	6
Level 5 (40–50 cm)	1	1	1	_	_	_	1	4
Level 6 (50–60 cm)	-	_	_	-	_	_	1	1
Totals	1	2	2	2	1	2	7	17

the lack of stratification and absence of pit edges in the lower portion of Feature 2, the precise relationship between the burial pit and the midden is not known. No attempt was made to date the burial or the lower midden deposits near the burial. Although the feature could predate the midden, the limited evidence suggests that the interment may be contemporaneous with the period of early midden formation. This suggests that the burial could be Early Archaic in age, but is more likely Middle Archaic or Late Archaic in age because the bulk of the occupational evidence from the site dates to these periods.

After the burial was discovered on 18 May 1999, Smith consulted with a representative of the Tonkawa tribe regarding treatment of the burial, then provided directives to the field archeologists. No further excavations were conducted in the immediate vicinity, and approximately 3 m³ of trench fill from the burial area was screened through 1/4-inch-mesh hardware cloth to recover human remains. All bones encountered in the screen were collected, and although the screened midden deposits contained many artifacts, none were collected. Nothing was encountered that could be considered a probable burial inclusion. The recovered bones were taken to the Cultural Resources Management Program office on Fort Hood, where they were stored temporarily. On 24 May 1999, Joan Baker (Department of Anthropology, Texas A&M University) examined the recovered bones and sorted materials into three groups: (1) animal bones; (2) human bones; and (3) indeterminate. Baker then conducted a brief descriptive analysis of the human skeletal remains, although she was not given permission to wash any of the remains. As summarized in Appendix D, the human remains represent the crania and a significant portion of the left side of a single juvenile, estimated age 6–10 years old. Sex and biological affinity could not be determined, and no evidence of unusual pathological conditions was observed.

Following the wishes of the Tonkawa tribal representative, Smith reinterred the collected

human remains with the intact portion of the burial on 3 June 1999, and all backhoe trenches were backfilled on 4 June 1999.

Features 6, 8, and 9

Features 6, 8, and 9 represent internal features within the general midden matrix of Feature 2. Feature 6, a basin-shaped hearth, was encountered at 45-76 cm in Test Unit 3 (Figure 8). Maximum excavated dimensions were 100 cm², but overall size could not be determined because the feature extended beyond the limits of the excavation to the north, south, and west. The feature consisted of four layers of burned rocks (n = 310, 102 kg). Only 33 percent of the rocks (33.5 kg) were tabular pieces less than 15 cm in size, and many slabs (n = 44) 15–35 cm in size comprise the bulk (66.5 kg) of the feature. Many rocks in the upper layers sloped to the north, but tabular pieces at the base of the hearth lay relatively flat. Along the west edge of the test unit, several rocks were vertical. Recycled as hearthstones, two large metate fragments were recovered from the central portion of the feature. Both were fractured in situ. Beneath the metates, a rockfree area measuring ca. 54 cm north-south by 44 cm east-west was apparent. In addition to the metates, the feature fill contained 1 latestage to finished biface, 101 flakes, and 330 unmodified bones. About 98 percent (n = 324) of the faunal assemblage was comprised of Vertebrata and Mammalia; one specimen each consisted of Colubridae, Leporidae, large Artiodactyla, and Lepus, Odocoileus, and

Table 15. Summary of cultural materials recovered from Analysis Unit 1, Feature 2, Test Units 8-11

Table 15. Summary of cultural materials	of cultural	materi		ed trom	recovered from Analysis Unit 1, Feature 2,	Onit I, F	eature Z,	Test Units 8-11	8-11				
Provenience	Dart Points	Perforator	ot egase to Finished Biface	Bifacial Knife	Miscellaneous Biface	End Scraper	Niscellaneous Uniface	Edge-modified Flake	Dafified Debitage	sətstəM	bəfiibomnU sənod	bəfiibomnU İsszuM slləd2	rotals
TEST LINIT 8													
5	c										c		L
17-20	n	I	I	I	I	I	I	I	I	I	N ·	I	ი -
Level 3 (20–30 cm)	I	I	I	1	I	I	I	I	I	ı	4	I	4
Level $4 (30-40 \text{ cm})$	4	I	I	I	I	I	I	ı	I	-	œ	ı	13
Level $5 (40-50 \text{ cm})$	I	1	ı	ı	I	1	I	ı	ı	1	24	က	28
Level $6 (50-60 \text{ cm})$	2	I	I	I	I	ı	ı	I	I	ı	13	1	16
Level 7 $(60-70 \text{ cm})$	I	I	I	I	I	ı	I	I	13*	ı	92	ı	88
Subtotals	6	1	0	0	0	0	0	0	13	1	127	4	155
TEST UNIT 9													
Level 4 (30–40 cm)	ı	I	1	1	ı	ı	I	ı	ı	1	1	1	1
Level $5 (40-50 \text{ cm})$	2	I	I	ı	I	1	I	I	I	ı	9	I	∞
Level $6 (50-60 \text{ cm})$	4	I	I	I	I	ı	I	I	I	ı	2	I	9
Level 7 (60–70 cm)	4	1	1	I	I	I	I	I	I	ı	94	အ	103
Subtotals	10	1	1	0	0	0	0	0	0	0	103	3	118
TEST UNIT 10													
Level $5 (40-50 \text{ cm})$	I	I	I	I	I	1	I	I	I	ı	I	I	П
Level $6 (50-60 \text{ cm})$	П	I	I	I	I	1	1	1	I	ı	က	I	4
Level 7 $(60-70 \text{ cm})$	I	I	I	I	I	I	I	I	I	ı	ĸ	I	2
Level $8 (70-80 \text{ cm})$	I	I	I	I	I	I	I	I	I	1	1	I	1
Level $9 (80-90 \text{ cm})$	1	ı	1		1	1	I	1	1	1	1	1	က
Subtotals	5	0	0	1	0	1	0	0	0	0	10	0	17
TEST UNIT 11													
Level $5 (40-50 \text{ cm})$	I	I	I	I	I	ı	ı	I	I	ı	I	ı	0
Level $6 (50-60 \text{ cm})$	2	I	I	I	1	ı	I	I	I	I	18	I	21
Level 7 (60–70 cm)	I	I	1	I	I	ı	I	I	I	ı	12	1	12
Level $8 (70-80 \text{ cm})$	1	I	I	I	I	I	1	1	***	ı	18	I	22
Level 9 (80–90 cm)	П	I	I	I	I	ı	I	ı	I	1	œ	1	11
Subtotals	4	0	0	0	1	0	1	1	1	1	26	1	99
TOTALS	28	2	1	1	1	1	1	1	14	2	596	8	356
NOTE: Ilmodified	John on ohidolo	d bormondo		100400									

NOTE: Unmodified debitage was observed but not collected.

* Flakes from this level were recovered from a processed flotation sample.

** Collected flake was thought to be a tool.

Table 16. Dart points from Analysis Unit 1, Feature 2, Test Units 8-11

Provenience	Castroville	Darl	Frio	Marshall	Pedernales	Provisional Type 1	Zephyr	$\operatorname{Untyped}$	Untypeable	Totals
Level 2 (15–20 cm)	1	_	_	1	1	_	_	_	_	3
Level 4 (30–40 cm)	1	_	1	_	2	_	1	1	1	7
Level 5 (40–50 cm)	_	_	_	_	2	_	_	_	_	2
Level 6 (50–60 cm)	1	_	1	_	4	1	1	_	1	9
Level 7 (60–70 cm)	_	2	_	1	_	_	_	1	_	4
Level 8 (70–80 cm)	_	_	_	_	_	1	_	_	_	1
Level 9 (80–90 cm)	-	-	-	_	-	-	-	1	1	2
Totals	3	2	2	2	9	2	2	3	3	28

Geomys spp. (see Appendix B). Only 24 of the bones exhibit spiral fractures. Charcoal recovered from feature fill at 62–76 cm produced a calibrated radiocarbon date of 795–425 B.C. (see Table 11). Seven flotation samples were submitted for macrobotanical analysis, but three did not contain any carbonized plant remains (see Appendix C). Three others yielded charred Ulmus and Quercus spp. wood; one sample comprised of the matrix surrounding the recycled, fractured metates yielded charred Quercus sp. wood and Plantago lanceolata. Aside from small roots, no evidence of disturbance to this feature was noted.

Feature 8 is an ash lens located along the eastern edge of Test Unit 9 at 59-70 cm. Maximum excavated dimensions were 70 cm north-south by 40 cm east-west. The feature was not exposed in the opposite (east) wall of Backhoe Trench 2, suggesting that it would not have measured more than 70 cm north-south by 120 cm east-west. Feature 8 was defined by an area of dense light gray ash surrounded by light brown ashy soil. Several areas of the feature were mottled, and the contact with the darker midden deposits was indistinct; in part, this was due to root bioturbation. In addition to the color and texture of the ashy deposit, Feature 8 was distinguished by a noticeable decrease in quantities of burned rocks compared to the surrounding midden matrix. The feature fill produced very sparse small burned rock fragments, 11 flakes, and 25 unmodified bones of Vertebrata, Mammalia, and Rodentia. Dense amounts of *Rabdotus* snail shells were observed

in the matrix. One flotation sample produced charred *Quercus* sp. wood, but another did not yield any carbonized plant remains (see Appendix C).

Feature 9, a shallow, basin-shaped hearth, was encountered at 64-93 cm in Test Units 4 and 8 (Figure 9). Maximum excavated dimensions were 135 cm north-south by 93 cm eastwest, and most of the feature was confined to Test Unit 8. Larger gravels delimited the northern and eastern margins of the hearth. Its southern edge was well defined in Test Unit 8, but the feature continued an unknown distance to the west beyond the limits of the excavations. The base of the hearth gradually sloped from south to north, and the feature was partially intrusive into the underlying gravelly sediment. Feature 9 consisted of two to three layers of burned rocks (n = 165; 109.5 kg), with larger tabular pieces around the perimeter and lining the base of the hearth. More than half of the rocks (n = 97; 59.5 kg) were 5-15 cm in size and were either thin, tabular pieces or very blocky, angular fragments. Five larger tabular rocks (15-30 cm) weighing 14 kg were present, and one large (25-35 cm) rock that was burned on its surface weighed approximately 22 kg. The remainder (n = 62; 14 kg) were small pieces (<5 cm). The feature fill produced 1 Pedernales dart point, 1 early- to middle-stage biface, 122 flakes, 291 unmodified bones, and 1 modified bone. Eighty-six percent of the faunal assemblage consisted of Vertebrata, but Artiodactyla, Mammalia, Leporidae, Rodentia, and species of Sylvilagus, Geomys, and Lepus were identified.

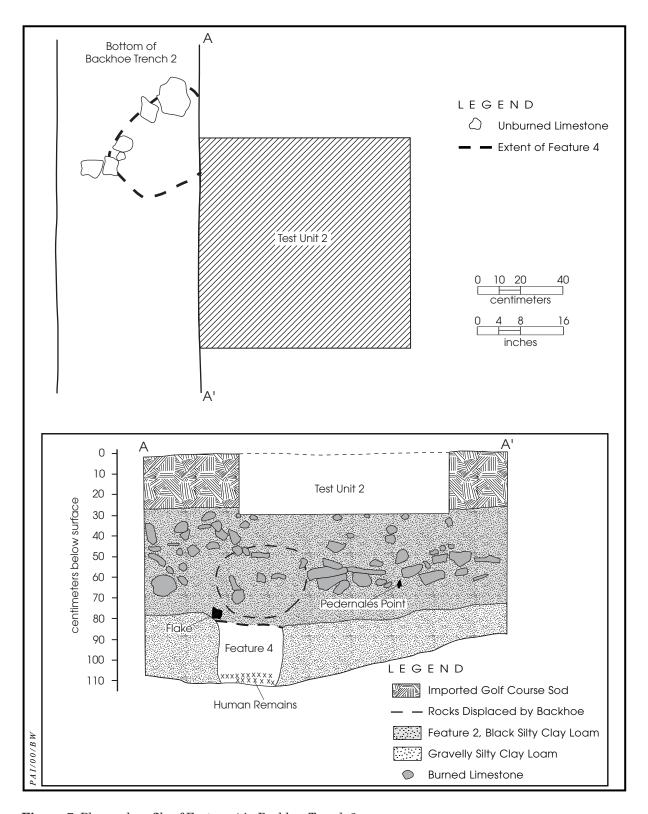


Figure 7. Plan and profile of Feature 4 in Backhoe Trench 2.



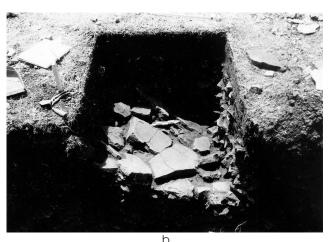




Figure 8. Photographs of Feature 6, a basin-shaped hearth, exposed at various stages in Test Unit 3. All views are west; north arrow scale is 25 cm. a) Feature 6 at a maximum depth of 60 cm below the surface; b) Feature 6 at a maximum depth of 80 cm below the surface, showing large metate fragments; c) close-up of Feature 6 with large metate fragments removed. Scale is located in rock-free area below the metates at ca. 80 cm below the surface.

Only 22 bones (7.6 percent) exhibited spiral fractures. The modified bone is a spirally fractured and charred medium to large Mammalia fragment that exhibits rounding and striations the length of the specimen. Charcoal recovered at 79–87 cm produced a calibrated radiocarbon date of 1955–1700 B.C. (see Table 11). One of four flotation samples did not produce carbonized macrobotanical remains; three samples yielded charred indeterminate and *Quercus* sp. wood, along with one *Quercus* sp. acorn fragment (see Appendix C). No disturbances were observed.

CULTURAL MATERIALS

Cultural materials associated with Analysis Unit 1 are discussed below (Table 17). Midden-associated artifacts consist of 3,989 chipped stone artifacts, 12 ground stone artifacts, 1 modified bone, and 1 modified mussel shell. Other cultural materials are categorized as unmodified bones (n = 1,464), unmodified mussel shells (n = 12), and burned rocks (total weight = 2,275.5 kg). Land snail shells were collected from archeological contexts but are not considered cultural. No attempt was made to quantify the collected snails, and they are not discussed in this chapter. The stone tools are further classified into individual tool groups outlined below.

Chipped Stone Artifacts

The chipped stone assemblage consists of 91 dart points, 76 other stone tools, 1 core, and 3,821 pieces of unmodified debitage. Excluding 1 dart point, all of these artifacts are manufactured from locally available chert resources. Projectile points were assigned to type groups by Elton Prewitt (personal communication 2000) using published typological data. The primary references used for the typological classification of most points were Suhm and Jelks (1962) and Turner and Hester (1993). Provisional Type 1 points were described by Kleinbach et al. (1999), and Zephyr points were described by Prewitt (1976). Excluding dart points, 76 other chipped stone tools



Figure 9. Photograph of Feature 9, a basin-shaped hearth exposed at 64–77 cm below the surface in Test Units 4 (foreground) and 8 (background); view is to the south. The arrow points to a Pedernales dart point found with the feature.

were recovered. These are classified into 9 different categories. Most ($n=69;\ 90.8$ percent) are associated with the Feature 2 midden; no lithic tools were recovered from Feature 8, the ash lens.

Dart Points

Of 91 dart points, 90 were recovered from midden contexts, mostly from Feature 2 (n = 86; 94.5 percent). This, in part, is a bias in sampling,

since most of the excavations were placed on this feature. Sixteen named types comprise a total of 68 points; 11 and 12 points are classified as untyped and untypeable, respectively (Table 18). Forty-seven (51.6 percent) are complete or nearly complete specimens, and 33 (36.3 percent) consist of proximal fragments. Only 13 (14.3 percent) exhibited evidence of intensive (presumably accidental) heating. Almost half (n = 45) of the dart points are manufactured from seven named Fort Hood chert types. Heiner Lake Tan (n = 13; 28.9 percent) is the most common, followed by Fort Hood Yellow (n = 8; 17.8 percent) and Heiner Lake Translucent Brown (n = 6; 13.3 percent). The remaining four types—Anderson Mountain Gray, Fort Hood Gray, Gray-Brown-Green, and Owl Creek Black-each represent less than 11 percent of the sample. Four of the seven identified chert types are resources located across the northern reaches of the reservation and probably represent materials not available in close proximity to the site (see Boyd [1990b] for cautionary notes relating to the Fort Hood chert typology). In addition, one Darl dart point is made of a nonlocal chert (see below).

ALMAGRE

This thick (12.3 mm), crude proximal fragment has a wide neck (20.9 mm) and a short (9.7 mm) haft length (Figure 10). This specimen probably represents a preform.

BULVERDE

One nearly complete specimen is finely flaked, relatively thin (6.3 mm), and has a ground base (see Figure 10).

Table 17. Summary of artifacts recovered from Analysis Unit 1 by feature

Provenience	Dart Points	Other Chipped Stone Tools	Core	Unmodified Debitage	Ground Stones	Modified Bone	Modified Mussel Shell	Totals
GENERAL BU	RNED RO	CK MIDDEN	DEPOSIT	ΓS				
Feature 1 Feature 2 Feature 3	4 86 -	4 69 1	_ 1 _	168 3,419 -	1 9 -	- - -	_ 1 _	177 3,585 1
INTERNAL FE	EATURES	WITHIN MII	DDEN DE	POSITS				
Feature 6 Feature 8 Feature 9	- - 1	1 - 1	_ _ _	101 11 122	2 - -	- - 1	- - -	104 11 125
TOTALS	91	76	1	3,821	12	1	1	4,003

CASTROVILLE

Seven Castroville dart points consist of three complete or nearly complete specimens and four proximal fragments (see Figure 10). The points range from 4.7 to 7.6 m thick and are 45.2–58.3 mm long. One specimen has been reworked and is alternately beveled; three exhibit evidence of high heating.

DARL

Six complete or nearly complete specimens and one proximal fragment comprise the Darl dart points (see Figure 10). Four exhibit grinding on the base or stem edges, two are alternately beveled, and one has been reworked. One point is manufactured from a nonlocal fine-grained chert. This mottled material is dark gray in color with gray brown streaks and many small cryptocrystalline inclusions.

EDGEWOOD

This proximal fragment has a ground base and stem edges (see Figure 10).

ELLIS

The Ellis dart points consist of one proximal fragment and one complete artifact. The latter (see Figure 10) has been heavily reworked

(maximum blade width of 15.7 mm) and is alternately beveled.

ENSOR

This proximal fragment has been intensively heated (see Figure 10).

FRIO

Two nearly complete and two proximal fragments are classified as Frio dart points. The former are thin, 5.2–5.9 mm thick, and both have serrated blades (see Figure 10).

MARCOS

Two proximal fragments exhibit severe heating (see Figure 10).

MARSHALL

The three Marshall dart points are proximal fragments that have slightly contracting to moderately expanding stems (Figure 11). One specimen has a ground base and utilized blade edges.

MONTELL

This proximal fragment is thin (6.0 mm) and finely chipped (see Figure 11).

Table 18. Classification, provenience, and attributes of dart points from Analysis Unit 1

rable to classification, provemence, at		marcs	id attributes of dart points from Analysis	11 5311107	JIII AIIA	1,9515 011	10.1			
Point Type	Test Unit (depth)	Feature	mumixsM hygn9J	Blade Length	Blade Width	dıgnəd ilaH	Иеск Width	Base Width	mumixsM ssənxəidT	Chert Type
Alamagre $(n = 1)$	Test Unit 4 (48 cm)	2	59.1	I	ı	9.7	20.9	14.0	12.3	indeterminate light brown
Bulverde $(n = 1)$	*	1	60.4	39.4	36.2	21.0	21.9	16.3	6.3	Anderson Mountain Gray
Castroville $(n = 7)$		0000	21.0 50.0 23.1	1 1 1	1 1 1	12.8 12.2	19.7 25.1 20.6	24.5 23.3	4.7 6.7 5.4	Heiner Lake Tan Heiner Lake Tan Anderson Mountain Gray
	1est Unit 4 (30–40 cm) * Test Unit 10 (50–60 cm) Test Unit 3 (20–30 cm)	N N N N	50.8 58.3 45.2 55.2	- 32.0 42.3	38.1 26.0 45.0	13.5 13.5 13.2 12.9	18.9 17.8 23.7	21.6 24.0	7.0 7.6 6.8 6.3	Hener Lake Tan Owl Creek Black Fort Hood Yellow indeterminate light brown
Darl (n = 7)	* Test Unit 9 (60–70 cm) * * * * * * * *	0000000	58.5 57.4 50.4 65.7 50.7 40.5	42.8 39.9 33.2 1 1 1 1	22.8 20.7 24.4 22.1 23.6 22.6 28.4	15.7 17.5 17.2 13.5 13.3 7.9 16.8	18.1 16.9 18.1 17.2 16.8 14.0 18.4	18.0 14.6 17.2 15.3 14.1 11.8 18.6	9.9 8.5 8.0 7.1 7.2 6.1 10.6	Heiner Lake Translucent Brown indeterminate dark gray Fort Hood Gray Fort Hood Yellow Heiner Lake Translucent Brown indeterminate nonlocal Fort Hood Gray
Edgewood $(n = 1)$ Ellis $(n = 2)$	* Test Unit 4 (40–50 cm) Test Unit 4 (20–30 cm)	20 20 20	28.0 28.2 23.7	18.6	- 15.7 23.3	9.6	15.0 13.6 14.3	18.0	5.8 5.9 6.1	indeterminate light brown Owl Creek Black indeterminate light brown
Ensor $(n = 1)$	*	2	33.5	ı	17.1	10.9	13.6	17.9	5.4	Owl Creek Black
Frio (n = 4)	Test Unit 11 (50–60 cm) Test Unit 3 (29.5 cm) Test Unit 10 (30–40 cm) *	0000	24.8 55.7 37.1 35.3	1 1 1 1	23.3 17.9	10.8 9.4 8.3 14.6	16.6 13.8 11.0 21.3	17.5 21.7 15.8 23.9	7.4 5.9 5.2 7.0	indeterminate light brown Owl Creek Black indeterminate light brown indeterminate light brown
Marcos (n = 2)	Test Unit 4 (20–30 cm) Test Unit 4 (20–30 cm)	2 2	$\begin{array}{c} 21.7 \\ 25.4 \end{array}$	1 1	1 1	9.3 8.8	13.3 13.3	20.5	5.3 6.3	indeterminate dark brown indeterminate dark brown
NOTE: All measurements are in millimet * Point collected from backhoe trench fill	NOTE: All measurements are in millimeters. * Point collected from backhoe trench fill.									

Table 18, continued										
Point Type	Test Unit (depth)	Feature	mumixsM hgagth	Blade Length	Blade Width	Haft Length	Neck Width	Base Width	mumixsM ssənəbidT	$\operatorname{Chert}\operatorname{Type}$
Marshall $(n = 3)$	Test Unit 8 (15–20 cm) * Test Unit 9 (60–70 cm)	222	41.8 34.5 23.1	1 1 1	- 43.5 -	11.0 11.3 12.4	16.3 17.3 16.1	19.2 17.0 16.1	7.6 7.5 6.0	Heiner Lake Translucent Brown Fort Hood Yellow indeterminate light brown
Montell $(n = 1)$	Test Unit 4 (30–40 cm)	2	63.1	I	38.2	12.0	24.0	25.3	6.0	Heiner Lake Translucent Brown
Nolan (n = 3)	* Test Unit 3 (80–90 cm) *	000	54.5 60.9 55.8	42.7 37.5	32.4 22.2 27.7	17.0 18.2 18.3	22.3 13.4 16.8	19.5 14.1 16.8	10.1 7.4 6.4	Heiner Lake Tan Anderson Mountain Gray indeterminate light brown
Pedernales (n = 27)	### Test Unit 8 (50–60 cm) Test Unit 11 (50–60 cm) Test Unit 11 (50–60 cm) Test Unit 1 (45 cm) Test Unit 9 (50–60 cm) Test Unit 9 (50–60 cm) #### Test Unit 9 (65 cm) #### Test Unit 10 (30–40 cm) #### Test Unit 10 (30–40 cm) #### Test Unit 8 (15–20 cm) #### Test Unit 8 (15–20 cm) #### Test Unit 4 (30–40 cm) #### Test Unit 4 (30–40 cm) #### Test Unit 4 (30–40 cm)	00000000000000000000000000000000000000	47.5 71.3 71.1 71.1 71.1 71.1 71.1 68.9 68.9 68.9 68.8 68.9 68.9 68.0 68.6 68.9 68.9 68.9 68.9 68.9 68.9 68.9	57.7 	24.5 33.7 33.7 1 22.1 30.9 30.8 30.8 30.8 30.9 30.9 30.9 30.9 30.9 30.9 30.9 30.9	16.0 13.6 12.6 20.5 20.5 24.1 24.1 13.4 22.0 22.0 18.0 16.5 17.4 17.4 19.1	20.5 14.2 16.2 17.8 19.0 17.8 19.5 19.5 19.5 17.9 17.9 17.9 17.9 17.9	14.0 16.2 16.0 17.3 16.2 16.6 17.2 17.2 18.6 21.8 18.9 25.7 18.9 18.9 18.9 18.9 18.9 16.7 16.7	7.7 7.8 7.9 7.8 7.8 7.9 7.9 7.9 7.9 7.9 7.9 7.9 7.9	indeterminate light brown Heiner Lake Tan indeterminate light brown indeterminate light brown Gray-Brown-Green indeterminate light brown Gray-Brown-Green Fort Hood Yellow indeterminate light brown Heiner Lake Tan Heiner Lake Tan Heiner Lake Tan Heiner Lake Tan indeterminate light brown Heiner Lake Tan indeterminate light brown Heiner Lake Tan indeterminate light brown Fort Hood Yellow Anderson Mountain Gray Heiner Lake Tan indeterminate light brown Fort Hood Yellow
	Test Unit 4 (30–40 cm)	1 23	30.4	1		21.1	1	1	7.6	Anderson Mountain Gray

Table 18, continued	,									
Point Type	Test Unit (depth)	Feature	Maximum Length	Blade Length	Blade Width	Haft Length	Neck Width	Base Width	mumixsM ssənxəidT	Chert Type
	Test Unit 9 (40–50 cm) Test Unit 8 (30–40 cm) – (64 cm)	888	17.3 63.9 55.8	_ _ 39.7	_ 33.6 24.7	_ 16.8 _	_ 18.8 16.2	_ 17.1 16.3	6.2 9.0 7.4	indeterminate light brown Fort Hood Gray Heiner Lake Translucent Brown
Provisional Type 1 $(n = 3)$	Test Unit 11 (70–80 cm) Test Unit 9 (54 cm) *	000	63.8 58.6 42.5	47.9 37.2 23.8	21.8 22.7 16.7	15.9 21.4 18.7	15.1 18.5 13.9	12.2 14.3 12.1	8.3 6.8 9.0	indeterminate light brown indeterminate light brown indeterminate light gray
Wells (n = 2)	* *	2 23	76.2	37.0 50.8	26.2 22.7	39.2 23.4	18.7	9.9	9.7	indeterminate light brown Gray-Brown-Green
Zephyr (n = 3)	Test Unit 10 (30–40 cm) * Test Unit 9 (50–60 cm)	010101	42.4 57.0 52.9	1 1 1	20.8 _ 25.2	11.7 9.8 13.4	14.6 15.2 16.3	15.6 16.7 19.6	7.0 7.1 8.0	Fort Hood Yellow indeterminate light brown indeterminate white
Untypeable (n = 12) Untyped (n = 11)	* Test Unit 4 (50–60 cm) Test Unit 11 (80–90 cm) Test Unit 19 (50–60 cm) Test Unit 4 (17–20 cm) Test Unit 4 (30–40 cm) Test Unit 9 (60–70 cm) * Test Unit 10 (80–90 cm) * Test Unit 9 (60–70 cm) * Test Unit 8 (30–40 cm) * Test Unit 3 (30–40 cm) * Test Unit 10 (80–90 cm) * Test Unit 3 (30–40 cm) * * * * * * * * * * * * * * * * * * *	200000000000000000000000000000000000000	26.2 26.0 26.0 26.0 38.9 38.9 40.9 40.9 40.9 40.9 40.9 40.9 40.9 60.0 60.0 60.0 60.0 60.0 60.0	25.6 1 1 1 1 1 25.6 53.3 53.3	20.1 20.1 - - - - - - - - - - - - -	13.3 	15.5 19.9 19.9 18.2 18.7 16.9 10.3	14.1 14.1 18.5 10.9 14.6	0.6.6.8.8.6.6.6.6.6.6.6.6.6.6.6.6.6.6.6.	indeterminate light brown indeterminate light brown Fort Hood Yellow indeterminate light brown
		4	0.20	0.4.0	1		10.0			meterimate ngm brown

Table 18, continued										
Point Type	Test Unit (depth)	Feature	Maximum Length	Plade Blade	Blade Width	Най Ьепgth	Neck Width	Base Width	mumixsM Rasimum	Chert Type
	Test Unit 3 (20–30 cm)	2	22.4	ı	I	10.3	19.8	20.2	5.2	Heiner Lake Tan
	*	2	27.5	I	ı	12.4	13.5	14.8	7.3	Heiner Lake Tan
	*	7	37.9	I	38.6	I	13.9	I	7.8	Owl Creek Black

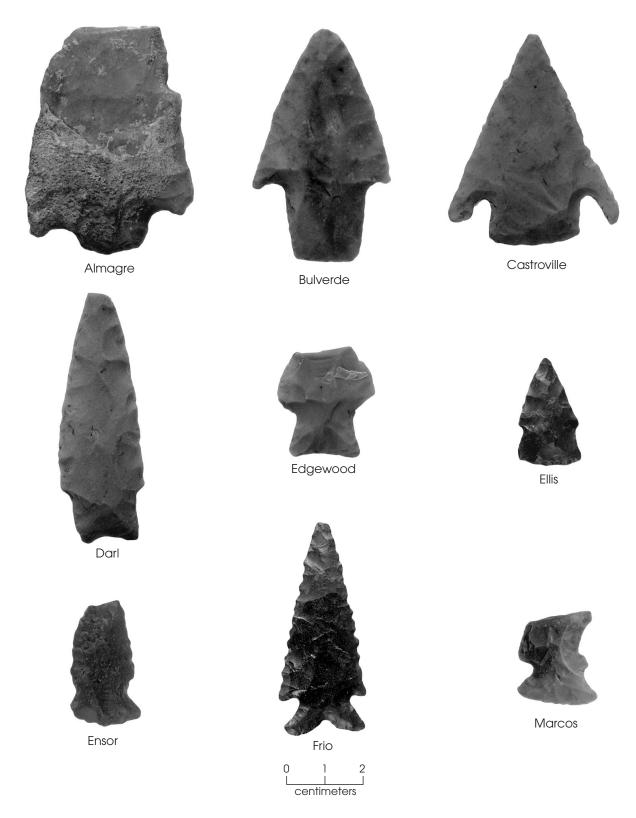


Figure 10. Dart points from Analysis Unit 1.

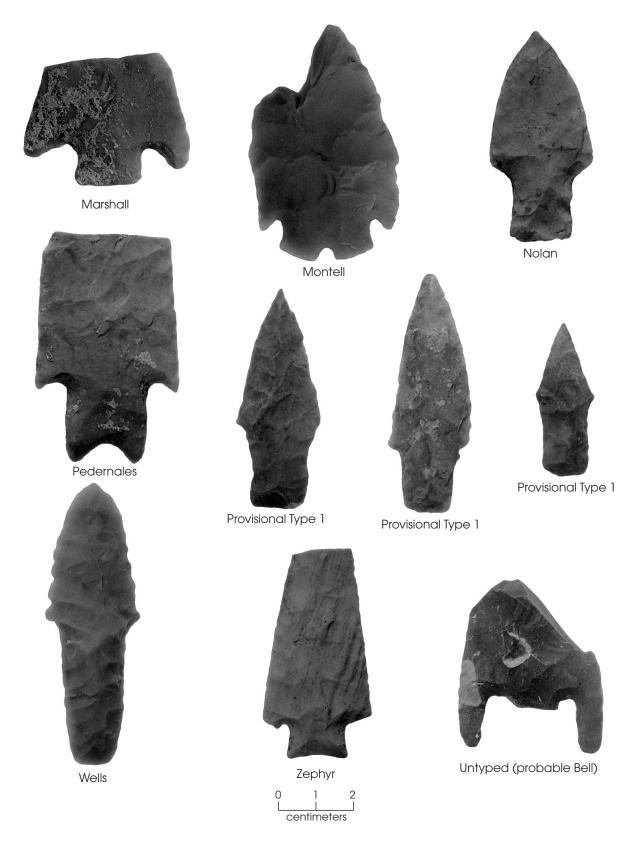


Figure 11. Dart points from Analysis Unit 1.

NOLAN

Two complete specimens and one proximal fragment comprise this point type. Both complete specimens exhibit utilized blade edges. In addition, one has been reworked and has a ground base and stem edges (see Figure 11).

PEDERNALES

Pedernales dart points comprise 39.7 percent (n = 27) of the named point types (see Figure 11). This category consists of 5 complete, 14 nearly complete, and 8 proximal specimens. The points vary from 5.1 to 10.4 mm thick; those with measurable neck and base widths indicate that almost all have slightly to prominently contracting stems. The complete or nearly complete artifacts range from 51.2 to 85.9 mm long. One nearly complete specimen exhibits utilized blade edges, along with a ground base and stem edges. Seven other points have been reworked or are alternately beveled. Only three exhibit evidence of high heating.

PROVISIONAL TYPE 1

These three complete points are moderately thick (5.0–8.3 mm) and have slightly contracting stems (see Figure 11). They range in length from 42.5 to 63.8 mm. The smallest specimen is reworked and has a ground base and stem edges. Descriptions of Provisional Type 1 points from Fort Hood and other Central Texas sites are presented by Kleinbach et al. (1999:335–344).

WELLS

The two complete Wells dart points are 74.2 to 76.2 mm long and 9.7 to 10.6 mm thick. The blade length (37.0 mm) of one reworked specimen is slightly less than the haft length (39.2 mm). This point also has a ground base and stem edges and a partially serrated blade (see Figure 11). The blade length (50.8 mm) on the second specimen is about twice as long as the haft length (23.4), and only one blade edge is partially serrated.

ZEPHYR

Two nearly complete artifacts and one proximal fragment comprise this point type, as

described by Prewitt (1976). One nearly complete specimen has a serrated blade and a ground base and stem edges (see Figure 11).

UNTYPEABLE

Twelve dart points could not be classified to a named type. This group includes 1 heavily reworked complete specimen, along with 1 proximal, 2 medial, 1 edge, and 7 distal fragments.

UNTYPED

Although 11 dart points are classified as untyped, 3 are identified as a probable Bell (see Figure 11), a probable Castroville, and a probable Pedernales. The untyped points consist of 1 complete and 4 nearly complete artifacts, along with 1 medial and 5 proximal fragments. One point is burinated, and a second burinated specimen has ground stem edges. One point has been reworked, and two other points have been intensively heated.

Perforators

One specimen is the distal end of a long (70.5 mm) tapered bit that is alternately beveled (Table 19). A second perforator is a proximal fragment representing a recycled corner tang biface (Figure 12). A diamond-shaped tang has been notched into one corner of the base.

Bifaces

The 39 bifaces include 5 early- to middlestage (12.8 percent), 16 late-stage to finished (41 percent), and 18 miscellaneous (46.2 percent) bifaces. The early- to middle-stage bifaces consist of 4 complete or nearly complete artifacts and 1 distal fragment. These ovate to circular bifaces are thick (18.3–41.6 mm) and retain various amounts of cortex. One complete specimen exhibits a battered edge. Three complete or nearly complete artifacts, 1 proximal, 3 medial, 4 distal, and 5 edge fragments comprise the 16 late-stage to finished bifaces. Fourteen specimens (87.5 percent) are less than 10 mm thick, and none of the specimens retain cortex. The complete artifacts are circular and tear-drop in outline. The 18 miscellaneous bifaces consist of 15 edge and 3 indeterminate fragments.

									-	
Provenience	Perforators	Early- to Middle- stage Bifaces	Late-stage to Finished Bifaces	Miscellaneous Bifaces	Bifacial Knife	End Scrapers	End/Side Scraper	Miscellaneous Unifaces	Edge-modified Flakes	Totals
Feature 1	_	2	_	_	_	_	_	_	2	4
Feature 2	2	2	15	18	1	2	_	8	21	69
Feature 3	_	_	_	_	_	_	1	_	_	1
Feature 6	_	-	1	_	_	_	_	-	_	1
Feature 9	_	1	_	-	_	-	_	_	_	1
Totals	2	5	16	18	1	2	1	8	23	76

Table 19. Summary of other chipped stone tools recovered from Analysis Unit 1 by feature



0 1 2 centimeters

Figure 12. Perforator (recycled corner tang biface) from Feature 2, Test Unit 8.

Bifacial Knife

This complete specimen is triangular in outline and has curved lateral edges (Figure 13). One lateral edge exhibits extensive wear (extremely smooth), and the opposite edge and base have been used minimally. The knife is relatively thick (15.0 mm) due to the presence of step fractures on both surfaces at the center of the artifact.

Unifaces

The 11 unifaces consist of 2 end scrapers, 1 end-side scraper, and 8 miscellaneous unifaces.

The 2 end scrapers are complete; 1 retains more than 50 percent cortex, while the other has little remaining cortex and exhibits high heating. Retaining no cortex, the complete end-side scraper is large (119.4x69.1 mm) and rectangular in outline (Figure 14). Two complete/nearly complete specimens, 1 proximal, 1 distal, and 4 edge fragments are defined as miscellaneous unifaces. The proximal fragment has a utilized edge.



Figure 13. Bifacial knife from Feature 2, Test Unit 10.



Figure 14. End-side scraper from Feature 3, Backhoe Trench 5.

Edge-Modified Flakes

Edge-modified flakes account for 30.3 percent (n = 23) of the other chipped stone tool assemblage. Ten are complete specimens; the rest consist of 5 proximal, 5 distal, and 3 edge fragments.

Core

The single core is an indeterminate fragment that exhibits evidence of intensive heating. This small artifact (35.4x30.0 mm) retains less than 50 percent cortex.

Unmodified Debitage

A total of 3,821 pieces of unmodified debitage were collected; 1,089 are complete, 883 are proximal fragments, 1,739 are chips, and 110 are chunks. Based on the amount of dorsal cortex present, 65 are primary, 240 are secondary, and 3,516 are tertiary. All but one quartz flake consist of locally available chert. Approximately 85 percent (n = 3,242) of the chert flakes are indeterminate; the rest represent 10 named chert types, with Fort Hood Yellow (n = 152; 4 percent) and Heiner Lake Tan (n = 118; 3.1 percent) being the most commonly identified types.

Ground Stone Artifacts

The ground stone artifacts consist of 1 complete mano and 11 metate fragments. The complete mano is an odd-shaped, unburned fossiliferous limestone cobble that weighs 6.74 kg (Figure 15). Its ground surface is 54.8 mm in diameter, and a knob opposite the ground surface may have served as a handle. Although the area around the base of the knob does not appear to be intentionally shaped, encrusted calcium carbonate on the surface would obscure such evidence. It is likely that this was a natural concretion that was intentionally selected for use as a mano because of its odd shape.

The 11 metate fragments are all limestone. Five unburned metate edge fragments range in weight from 9.9 to 52.8 kg. Three exhibit grinding on one surface, and 2 are double-sided (see Figure 15). One specimen has a pitted depression measuring 24.1x20.8 mm, but it is incomplete due to breakage. This nutting area is near the metate's smooth grinding surface. The other 6 metate fragments are burned, indicating that they were recycled artifacts. These specimens weigh between 1.33 and 46.2 kg, and 1 is double sided. The two largest burned metate fragments were recycled as hearthstones in Feature 6 (see Figure 8). These had maximum dimensions of 350x240x100 mm (46.2 kg) and 466.6x330x60.6 mm (35.2 kg); both were fractured in place.

Faunal Remains

Modified Bone

A long bone fragment recovered from Feature 9 is from a canid- to deer-sized mammal

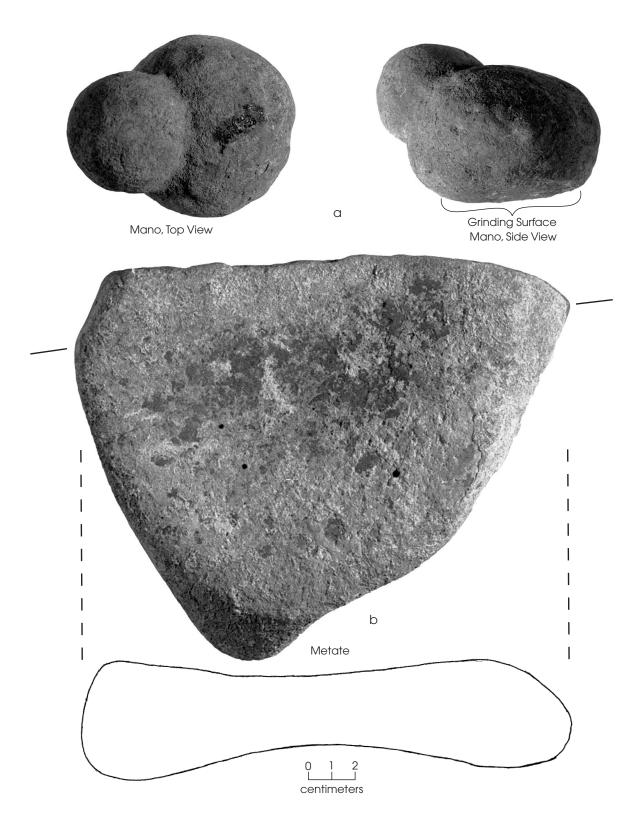


Figure 15. Ground stone artifacts. a) Mano from Feature 2, Backhoe Trench 2; b) metate from Feature 1, Backhoe Trench 18.

and is spirally fractured, charred, and modified (see Appendix B). The entire length (51.3 mm) of the bone is rounded and exhibits deep longitudinal striations. The purpose for this modification is not known, but the bone may have been used as an awl-like tool. The striations most likely represent use wear or were created by shaving when the implement was made.

Modified Mussel Shell

One eroded mussel shell fragment (probable *Cryotonaias tampicoensis*) is perforated. Since the shell is broken along the drill hole, the opening is incomplete. Although the opening measures 9.0 mm, this may be slightly larger than originally drilled because the interior margins are also eroded and flaking.

Unmodified Bones

A total of 1,464 unmodified bones were recovered, representing 23 aquatic and terrestrial taxa or animal size groups (see Appendix B). The assemblage is dominated by vertebrates (n = 1,040; 71.0 percent) and canid-to deer-sized mammals (n = 313; 21.4 percent), along with deer-pronghorn (n = 31; 2.1 percent). About 21.8 percent (n = 319) of the remains exhibit spiral fractures, suggesting breakage for marrow extraction and grease rendering. In addition, one spirally fractured fragment from a canid- to deer-sized mammal exhibits an impact fracture.

Unmodified Mussel Shells

Twelve unmodified mussel shells are highly eroded or weathered. One each are identified as *Cryotonaias tampicoensis* and probable *Quadrula* sp.; the remaining 10 shells consist of 5 *Amblema plicata* and 5 unidentifiable specimens.

Burned Rocks

The hand excavations yielded 7,664 burned rocks (total weight = 2,275.5 kg). All observed burned rocks are limestone and appear to be local in origin. The vast majority consist of nonfossiliferous limestone.

Macrobotanical Remains

Twenty-four samples were submitted for macrobotanical analysis; 11 and 13 were collected from general midden contexts and internal features, respectively (see Appendix C). Eight samples did not contain carbonized plant remains, and the rest (n = 16) produced small amounts of charred materials—wood, a few acorn fragments, and one seed. Although the results suggest relatively poor preservation, other internal midden features could yield better-preserved plant remains.

MIDDEN CHRONOLOGY

Radiocarbon dates, temporally diagnostic artifacts, and the geomorphic investigations reveal that the expansive midden deposits and associated internal features at 41CV413, Subarea B primarily represent repeated Late Archaic occupations (2050 B.C. to A.D. 800). Calibrated dates of 1955 to 1700 B.C. and 795 to 425 B.C. obtained from internal hearths indicate use during the early half of the Late Archaic period, when Bulverde and Pedernales dart points were the prevailing style (Collins 1995). Of the 68 dart points assigned to a named type, 28 (41.2 percent) are identified as these two diagnostic points. Thirty-one (45.9 percent) of 68 dart points correspond to the later half of the Late Archaic period. Although 10 different point styles are represented, Castroville and Darl dart points dominate (n = 14; 45.2 percent).

Absolute chronometric data, though limited, did not yield evidence of earlier occupations. However, site stratigraphy and relative dating hint that older components may be present. Compared to the large volume of midden deposits present on site, the excavation sample is very small. Much of the midden matrix is underlain by a Fort Hood-age channel gravel deposit, and selected portions of the midden may have initially accreted during the Middle Archaic period on this stabilized surface. In addition, the Wells dart points (n = 2) are Early Archaic, and the Almagre, Nolan, and Provisional Type 1 dart points (n = 7) correspond to the Middle Archaic period. However, a few of these points are reworked and may represent items picked up elsewhere and reused.

CULTURAL ACTIVITIES AND MIDDEN FORMATION

Generally, Central Texas burned rock middens produce great amounts of cultural materials that, as a whole, have limited interpretability due to a lack of stratigraphy and isolable temporal components. Although this is true for the general midden matrix at 41CV413, a comparison of the three hand excavations that sampled the full vertical extent of midden deposits reveals gross differences in the frequencies of cultural material types (Table 20). Compared to Test Units 1 and 3, Unit 4 yielded much greater quantities of stone artifacts and unmodified bones but the least amount of burned rocks. This indicates different activities occurring in various areas, probably at different times. Although Test Unit 3 yielded the most burned rocks, the average weight is low (0.14 kg), indicating that most were small, highly fractured pieces.

From eight test units excavated through the midden fill, the faunal assemblage is dominated by vertebrate and canid- to deersized mammals. Other identified animals consist of turtles, snakes, birds, rabbits, hares, rodents, deer, and deer- to pronghorn-sized ungulates. One-third of the remains exhibit spiral fractures, providing strong support for the hypothesis that bone was processed for grease extraction or rendering. In addition, one canid- to deer-sized bone fragment was struck by a hard object, suggesting intentional breakage. Although limited in number, mussel shells reveal that this aquatic resource was exploited. In addition, a drilled shell fragment was probably modified for ornamental purposes. Eight of 11 flotation samples produced charred remains—indeterminate, sycamore, and oak wood, and an oak acorn fragment. Although a single charred acorn fragment could be incidental, mano and metate fragments provide further evidence of plant processing. In addition, a portion of one metate has a pitted depression that may have been used as a nutting stone (Turner and Hester 1993:308-309), suggesting that acorn or nut processing may have occurred. Various stages of lithic reduction are represented by expedient and formal tools, with Fort Hood Yellow and Heiner Lake Tan being the most commonly identified chert types in the assemblage.

Within the general midden matrix, four discrete features suggest specific and diverse cultural activities. Two large, basin-shaped hearths (Features 6 and 9) contained sparse stone artifacts and a moderate amount of vertebrate remains. The faunal assemblages from these hearths include rabbits and hares, deer- to pronghorn-sized ungulates, snake, pocket gophers and unidentified rodents, deer, and possible bison or elk. A small percentage of the bones are spirally fractured and may represent discarded debris associated with bone grease processing. Identified charred plant remains from one hearth consist of oak wood and one oak acorn fragment; again the latter could be inadvertently attached to the wood fuel, or cracked acorn shells could have been intentionally burned as fuel. The other hearth produced oak and elm wood, in addition to one water plantain seed. Although inconclusive, the seed hints that a species of edible plantain (potherb or greens) was used as a food resource. In general, the hearths may have served as multipurpose cooking facilities (i.e., generalized baking pits) where various kinds of plant processing occurred. Approximately 4 m south and 9 m north of the hearths, an 11-cm-thick ash lens (Feature 8) yielded sparse burned rock fragments, bones, charred oak wood, and flakes, along with dense Rabdotus snail shells. No indication of a prepared hearth was apparent, and the feature is interpreted as a dump episode associated with hearth cleaning. It is not known if the ash lens is associated with the excavated hearths or another, unexcavated feature.

Mortuary practice is evidenced by the presence of a burial pit (Feature 4) in the lower part of (or below) the midden. The inability to completely excavate the interment precludes a full interpretation. The origins of the pit are not clear, and a temporal assignment cannot be made with any degree of confidence, but the burial predates or, more likely, correlates to the early period of midden accumulation. The burial pit is at least 29 cm deep, and its profile reveals that the in situ human remains are near the base of the pit (see Figure 6). Large unburned rocks found around the perimeter near the bottom of the pit could represent naturally occurring rocks in the gravelly substrate or may have been intentionally placed. The displaced human remains represent one individual, approximately 6–10 years old. Sex could not be determined.

Table 20. Comparison of cultural material frequencies in burned rock midden deposits in Test Units 1, 3, and 4*

Provenience	Volume Excavated	$ \begin{array}{lll} Volume & Total Burned \\ Excavated & Rocks (\# per m^3) \end{array} $	Weight of Burned Rocks (kg per m³)	Average Weight of Total Stone Tools Total Debitage Burned Rocks (kg) $(\# per m^3)^*$ $(\# per m^3)$	Total Stone Tools (# per m^3)*	Total Debitage (# per m³)		
Test Unit 1, Feature 1 $0.60 \mathrm{m}^3$		1,403 (233.8)	600.75 (100.1)	0.43	5 (0.83)	168 (28)	32 (5.3)	2 (0.3)
Test Unit 3, Feature 2 0.75 m^3	$0.75~\mathrm{m}^3$	1,816 (242.1)	258.00 (34.4)	0.14	12 (1.6)	356 (47.5)	109 (14.5)	1 (0.1)
Test Unit 4, Feature 2 0.63 m^3	$0.63 \mathrm{m}^{3}$	658 (104.4)	308.75 (49)	0.47	72 (11.4)	2,915 (462.7)	373 (59.2)	1 (0.2)
* Includes cores.								

No radiocarbon assays were obtained from general midden contexts, but the accumulations probably represent hundreds or thousands of years of continual or intermittent reuse and subsequent mixing of cultural materials within a homogeneous matrix. Despite this, the site stratigraphy allows for general chronological placement of the midden deposits because they formed on gravelly Fort Hood channel fills that stabilized at ca. 2800 B.C. The midden consists of anthropogenic cultural deposits, primarily incorporating West Range alluvium.

A main focus in understanding midden formation is to identify internally discrete features that represent dateable cultural activities. The two hearths are at the same depth below surface and are located approximately 18 m apart, but they are separated in time by ca. 965 years. This provides evidence that different parts of the midden developed at different times. If future investigations encounter additional internal features or discrete activity areas, absolute dating of these events is critical in interpreting midden formation.

RESULTS OF INVESTIGATIONS: NONMIDDEN DEPOSITS

Kyle Killian

The investigations presented in this chapter include cultural materials encountered both beyond the edges of observable midden deposits (i.e., Features 1, 2 and 3) and beneath these midden deposits. Stratigraphically, the non-midden deposits that were investigated predate the period of intensive midden formation (i.e., Late Archaic), and radiocarbon dates indicate an Early-to Middle-Archaic date for the activities represented by these cultural materials. However, the complete history and evolution of the midden are not known at this stage, and the relationship between midden and nonmidden components is not fully understood.

The nonmidden deposits at 41CV413, Subarea B are defined as Analysis Unit 2 and consist of both feature and nonfeature contexts. In the following discussion, the nonfeature contexts are discussed first, followed by the cultural features. Next, all the cultural materials recovered from nonmidden deposits are described as a single assemblage. Finally, the chronology and cultural activities of these nonmidden deposits are discussed and summarized.

Burned rocks were the only cultural materials observed in nonmidden backhoe trenches; they were found in Trenches 6, 7, 9, and 16. Nonmidden deposits were sampled through hand excavation in seven test units, which encountered four features—Features 5, 7, 10, and 11—and yielded 297 stone artifacts, 481 unmodified bones, and 588 burned rocks (Table 21). Most of these stone artifacts and bones occurred in nonfeature contexts, but a substantial portion (22.9 percent of the stone artifacts and 32.8 percent of the unmodified bones) were associated with three of the four features. The majority of burned rocks encountered (88.9 percent) were associated with Features 5 and 7.

NONFEATURE CONTEXTS

Nonfeature deposits include all handexcavated levels, regardless of cultural content, that are not encompassed within a feature. However, the 10-20 cm of modern artificial fill is excluded; this fill was usually discarded without screening upon excavation. Comparison of artifact counts from nonfeature excavations is complicated by the fact that in some cases (i.e., Test Units 9 and 11), only diagnostic artifacts and formal tools were collected while the rest of the cultural materials were noted but not quantified (see Chapter 3). In contrast, two flotation samples collected in Feature 9 represent full recovery of all artifacts except burned rock. Nevertheless, Test Units 1 and 9 contain the highest quantities of artifacts, and the remainder of the nonfeature excavations contained only limited cultural materials.

Nonfeature deposits were encountered in four contexts. First, deposits in Test Unit 11 from 20 to 40 cm consisted of culturally sterile deposits below the artificial fill of the turf and above Feature 2. These deposits probably represent modern fill. The second group of nonfeature deposits lie between the midden (Features 1 or 2) and a lower feature. This group is composed of deposits from 60 to 80 cm in Test Unit 1 and 90 to 110 cm in Test Unit 11. These deposits vary greatly in cultural content. The third group lies below all other cultural deposits and includes deposits at 115-120 cm in Test Unit 1, 90–110 in Test Unit 3, 70–90 cm in Test Unit 9, and 80-90 cm in Test Unit 4. This group of nonfeature deposits generally contained sparse cultural materials, though in some cases they were culturally sterile. The final group is composed of deposits around isolated, off-midden

Table 21. Summary of Analysis Unit 2 excavations and cultural materials

Provenience	Feature Context	Dart Points	Other Chipped Stone Tools	Unmodified Debitage	Unmodified Bones	Burned Rocks
TEST UNIT 1	T catale context		<u> </u>			
Level 7 (60–70 cm) Level 8 (70–80 cm) Feature 7 (77–115 cm) Level 12 (115–120 cm)	below midden Feature 1 below midden Feature 1 occupation zone below Feature 7	1 1 1	- - 2 -	78 25 54 –	18 17 150	12 21 354 -
TEST UNIT 3						
Levels 10–11 (90–110 cm)	below midden Feature 2	_	1	1	_	6
TEST UNIT 4						
Level 9 (80–90 cm)	below midden Feature 2	_	1	10	1	26
TEST UNIT 5						
Levels 1–8 (0–80 cm) Level 9 (80–90 cm) Level 10 (90–100 cm)	removed by backhoe nonfeature nonfeature	- - -	- - -	_ _ _	- - -	_ _ _
Level 11 (100–110 cm) Feature 5 (85–117 cm)	nonfeature basin-shaped hearth	_	_	3	_	132
TEST UNIT 7	-					
Levels 1–9 (0–93 cm) Level 10 (93–100 cm) Feature 11 (97–105 cm) Level 11 (100–110 cm)	removed by backhoe nonfeature burned rock concentration nonfeature	- - -	- - - -	- 6 - 2	- - 3 -	- - 17 -
TEST UNIT 9						
Level 8a* (69–75 cm) Level 8 (70–80 cm) Level 9 (80–90 cm)	below midden Feature 2 below midden Feature 2 below midden Feature 2	- 1 1	- - -	102 ** **	254 19 14	*** ***
TEST UNIT 11						
Level 3 (0–30 cm) Level 4 (30–40 cm) Level 10 (90–100 cm)	above midden Feature 2 above midden Feature 2 below midden Feature 2 below midden Feature 2	- - -	_ _ _	** ** ** **	_ _ _	 *** ***
Level 11 (100–110 cm) Feature 10 (110–115 cm)	basin-shaped hearth	_	_	8	_ 5	20
Subtotals, Nonfeature Cont Subtotals, Feature Contexts	exts	4	2 2	224 65	323 158	65 523
Totals		5	4	289	481	588

Feature contexts.

^{*} Flotation samples F–31 and F–34.

^{**} Unmodified debitage was observed but not collected.

^{***} Burned rocks were observed but not quantified.

features and includes the deposits at 80–110 cm in Test Unit 5 and 93–110 in Test Unit 7.

CULTURAL FEATURES

Four burned rock features were excavated in the nonmidden deposits at 41CV413. Features 5 and 10 are basin-shaped hearths, Feature 7 is an occupation zone containing a possible dispersed hearth, and Feature 11 is a burned rock concentration.

Feature 5

Feature 5, a slab-lined hearth, was encountered in Backhoe Trench 10 at 85–117 cm (Figure 16). It was excavated within Test Unit 5, which was placed on the bottom of the backhoe trench. This isolated feature is situated approximately 40 m northwest of Feature 2. The excavated portion of the feature covers the entire 1x1-m unit, but its actual size is not known. The eastern limit of Feature 5 was included within the excavation, while Backhoe Trench 10 truncated the southern edge of the feature. The feature continued to the north and west beyond the limits of Test Unit 5.

Burned rocks associated with Feature 5 were first encountered at 85 cm below the surface in the southeastern quadrant of the unit. An accumulation of smaller, angular burned rocks (n = 110; 26 kg), all less than 15 cm in maximum length, was present from 85 cm to depths ranging from 95 to 113 cm (Table 22). This layer of burned rocks lay on top of the primary feature, which was composed of larger, tabular burned rocks (n = 22; 47.5 kg) forming a crude basin shape. The largest slabs were lying flat in the center of the feature and were surrounded by smaller tabular fragments that sloped inward toward the center. Judging by their positions, many of the smaller tabular pieces were probably fragments of larger slabs, these may represent only two or three large rocks. A 1-cm-thick layer of sediment was observed between the upper layer of angular rocks and the lower slab-lined basin below. Although the lower portion of Feature 5 definitely represents an in situ rocklined hearth or baking pit, the upper layer appears to be hearth fill or debris discarded into the shallow pit.

Feature 5 was found within a Bwb soil horizon of West Range alluvium that contained

unburned limestone inclusions. The feature rested on a Bwkb soil horizon of Fort Hood alluvium (see Appendix A, Backhoe Trench 10 soil profile). Above the feature, a lens of dense, ca. 20-cm-thick, yellow gravel separated it from a layer of dark gray clay loam containing some burned rocks. This dark layer is an Ab soil horizon in West Range alluvium that probably represents a stratigraphic zone related to the midden deposits of Feature 2.

Three unmodified flakes, one flotation sample, and two charcoal samples (C-1 and C-2) were collected from the Feature 5 fill. The flotation sample contained small amounts of unidentified charred wood (see Appendix C). Charcoal Sample C-2 was collected from the northwestern edge of the hearth at 103 cm, but it contained insufficient carbon and failed to yield a radiocarbon date. Sample C-1 was collected from the southeastern edge of the hearth at 98 cm and yielded a calibrated radiocarbon date of 3975–3765 B.C. (see Table 11).

Feature 7

Feature 7, an occupation zone containing scattered burned rocks and artifacts, was found below midden Feature 1 at 77-115 cm in Test Unit 1. Test Unit 1 was located on the south side of Backhoe Trench 18 at its west end. The excavated dimensions of Feature 7 were 1x1 m. but its actual size is not known. Burned rocks continued beyond the limits of the test unit to the west, and the northern edge of the feature may have been slightly truncated by Backhoe Trench 18. The burned rocks present in the eastern and southern portions of the unit were sparse, suggesting that the feature thins out beyond the test unit in those directions. Feature 7 was encountered at approximately 20 cm below the level of midden deposits in this area (i.e., Feature 1 ended at approximately 60 cm), and part of this feature appears to have been cut into a layer of light brown gravelly loam that transitioned gradually to gravelly orange clay or clay loam with depth.

Although Feature 7 consisted primarily of a dispersed layer of burned rocks and cultural materials, a semicircular concentration of small and angular burned rocks was confined to the northwest quadrant of Test Unit 1. In profile, the circular concentration of burned rocks was lying in a basin-shaped depression. At the base

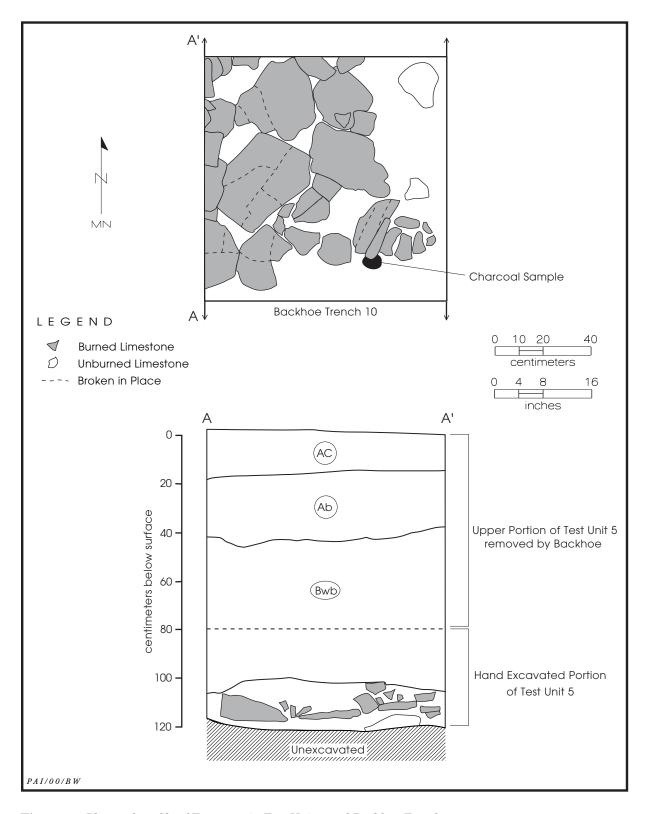


Figure 16. Plan and profile of Feature 5 in Test Unit 5 and Backhoe Trench 10.

Table 22. Sullilla	ry or burned	TOCKS HOM IV	eature o			
	Small .	Angular*	Large 7	Γabular**	То	tals
Size	Number	Weight (kg)	Number	Weight (kg)	Number	Weight (kg)
<5 cm	39	3.0	_	_	39	3.0
5–15 cm	71	23.0	14	5.5	85	28.5
15–25 cm	_	_	5	17.0	5	17.0
25–35 cm	_	_	2	13.0	2	13.0
>35 cm	_	_	1	12.0	1	12.0
Totals	110	26.0	22	47.5	132	73.5

Table 22. Summary of burned rocks from Feature 5

of this depression, a 12-cm-long tabular burned rock was noted, accompanied by an accumulation of smaller, angular burned rocks similar to those that defined the perimeter of the concentration. This pit-like feature appeared to be a dispersed hearth, but intruded into and was associated with the more extensive occupation zone (Figure 17).

Fifty-seven lithic artifacts were recovered from Feature 7, consisting of 1 Martindale dart point (Figure 18), 2 edge-modified flakes, and 54 unmodified flakes. A total of 354 burned rocks, weighing 95.5 kg, were present within this feature (Table 23). Most of these burned rocks (n = 106; 30.5 kg) were recovered at 77-108 from the semicircular concentration on the north edge of the test unit. This same portion of the feature also contained several faunal specimens and the Martindale dart point (found at 86 cm). In addition, two charcoal samples (Samples C-8 and C-9) were taken from this location. Most of the faunal remains collected during excavation were identified as deer-sized Artiodactyla or Mammalia, approximately half of the bones are spirally fractured, and most are charred or calcined. Specimens recovered from two flotation samples represent several other taxa (see Appendix B). The flotation samples also contained fragments of charred oak (see Appendix C). Sample C-9, collected among the feature rocks at 93 cm, yielded a calibrated radiocarbon date of 2895-2590 B.C. (see Table 11).

Feature 10

Feature 10, a basin-shaped hearth, was encountered below midden Feature 2 (at 108–125 cm in Test Unit 11) and located on the south

side of Backhoe Trench 4 near the north end. The excavated dimensions of the feature were 100x70 cm, but its actual size is unknown. The feature continued beyond the limits of the test unit on the east and west, and Backhoe Trench 4 truncated an unknown quantity of the feature on the north. The southern edge of the feature was visible within the test unit.

This hearth was composed of two to three layers of burned rocks. Twenty burned rocks, weighing 14 kg, were recovered; these were primarily tabular pieces, some of which were fractured in situ. Due to time constraints, Feature 10 was not completely excavated, and the lower rocks were left in place.

The only artifacts recovered from this feature were eight unmodified flakes. One flotation sample collected among the feature rocks at 110–115 cm contained four fragments of unidentified charred wood (see Appendix C). The faunal assemblage from Feature 10 consists of five fragmentary vertebrata specimens (see Appendix B).

Feature 11

Feature 11, a burned rock concentration, was encountered at 97–105 cm in Test Unit 7 (Figure 19). This test unit was located by Backhoe Trench 8 near the center of its western side. Feature 11 had dimensions of 58x54 cm (long axis east-west) and was contained entirely within Test Unit 7. This is an isolated feature located approximately 40 m south of the burned rock midden area.

The concentration consists of a single layer of tightly clustered small- to medium-sized burned rocks in a 2Bwb soil horizon of Fort Hood

^{*} Upper portion of feature.

^{**} Lower, slab-lined basin.

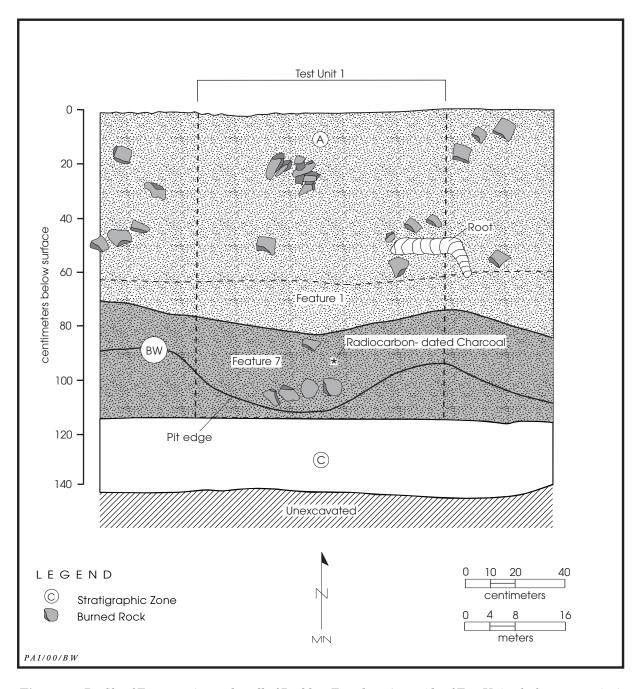


Figure 17. Profile of Feature 7 in south wall of Backhoe Trench 18 (east side of Test Unit 1 before excavation). Soil descriptions correspond to Zones 1–3 in Backhoe Trench 1 (see Appendix A).

pieces appeared to be burned only on one side, as if they had been heated in place. The burned rocks fell into two size categories: 5-15 cm (n = 12, 8.5 kg) and 15-25 cm (n = 5, 9.5 kg).

The only artifacts associated with this feature were two heavily patinated flakes recovered from the fill surrounding the feature.

alluvium. Other than being clustered close together, the concentration had no obvious patterning (i.e., a basin shape or a clear circular ring), and no discoloration of the surrounding soil was observed. Some of the larger burned rocks were thick tabular fragments that fractured in place. Some of the smaller, irregular



Figure 18. Martindale dart point from Test Unit 1, Feature 7.

A flotation sample was collected but contained no charred plant remains (see Appendix C). The faunal assemblage from Feature 11 consists of three vertebrata fragments (see Appendix B).

CULTURAL MATERIALS

A total of 297 lithic artifacts were recovered from the nonmidden components of 41CV413, Subarea B (see Table 21 and Appendix D). The majority (n = 229, 77.1 percent) of these artifacts were recovered from nonfeature contexts. Eighty-three (27.9 percent) of the lithic artifacts were recovered from flotation samples. Lithic artifacts were accompanied by 481 faunal specimens (see Appendix B). Burned rocks were quantified in the field, but not collected. All of these cultural materials were recovered from 60 to 115 cm; they are described according to artifact groups below.

Dart points

Five dart points were recovered from nonmidden deposits. Table 24 presents their point type classification, provenience data, and metric attributes. All of these dart points were recovered between 60 and 90 cm below the surface. One untyped dart point was manufactured from Gray-Brown-Green chert, while the other four were manufactured from indeterminate chert types. Only the Martindale dart point exhibits edge grinding on its stem and base (see Figure 18 above). The untyped dart point

has an expanding stem. One Bulverde dart point exhibits alternate beveling.

Early- to Middle-Stage Biface

One complete biface was recovered from nonmidden deposits. The specimen is highly patinated and lightly heated. Less than 50 percent of its dorsal surface retains cortex.

Edge-Modified Flakes

The artifact assemblage contains two edgemodified flakes. Both specimens are lightly patinated fragments (one distal and one medial). One of the specimens retains cortex on less than 50 percent of its dorsal surface, and the other has been lightly heated.

Unmodified Debitage

A total of 289 unmodified flakes were recovered from nonmidden deposits. Most $(n=224,\ 77.5\ percent)$ were recovered from nonfeature contexts, while Feature 7 produced 54 (18.7 percent) flakes and the other three features produced 11 (3.8 percent). The assemblage is dominated by complete specimens $(n=117,\ 40.5\ percent)$. Most of the specimens $(n=232,\ 80.3\ percent)$ exhibit some degree of patination, and 144 (49.8 percent) specimens exhibit some degree of heat treatment. Indeterminate chert types $(n=183,\ 63.3\ percent)$ are most frequently represented, followed by Fort Hood Yellow $(n=40,\ 13.8\ percent)$ and Heiner Lake Translucent Brown $(n=23,\ 8.0\ percent)$.

Unmodified Bones

A total of 481 faunal specimens was recovered from nonmidden contexts (see Appendix B). Of these, 323 (67.2 percent) were recovered from

Table 23. Summary of burned rocks from Feature 7

Size	Number	Weight (kg)
<5 cm	160	20.5
5–15 cm	193	70.0
15–25 cm	1	5.0
25 – $35~\mathrm{cm}$	0	0.0
Total	354	95.5



Figure 19. Photograph of Feature 11, a burned-rock concentration exposed in Test Unit 7 (base of unit at 110 cm); view is north.

nonfeature contexts and $158 (32.8 \, \text{percent})$ were recovered from Features 7 (n = 150), $10 \, (n = 5)$, and $11 \, (n = 3)$. Only 106 bones (22.0 percent) are spirally fractured, and 130 (27.0 percent) are charred or calcined. Of the 130 specimens that exhibit burning, $72 \, (55.4 \, \text{percent})$ were recovered from Feature 7.

INTERPRETATION OF PREHISTORIC OCCUPATIONS

Chronology

Charcoal samples from nonmidden deposits yielded two radiocarbon dates, both associated with burned rock features. One sample collected from Feature 7 (93 cm) yielded a calibrated radiocarbon date of 2895–2590 B.C. This dates the deposits below the main portion of the Feature 1 midden to the latter half of the Middle Archaic period. One diagnostic

artifact, a Martindale dart point recovered from the same context, coincides with the end of the Early Archaic.

The second dated charcoal sample was recovered from Feature 5 (98 cm) and yielded a calibrated radiocarbon date of 3975–3765 B.C. This suggests an occupation at the transition from the Early to Middle Archaic periods, but no diagnostic artifacts were recovered from the same context. These dates contrast with the radiocarbon dates associated with the midden deposits (see Chapter 5). Radiocarbon dates, the majority of diagnostic artifacts, and the alluvial stratigraphy all suggest that the bulk of the burned rock midden deposits accumulated during the Late Archaic period.

Though it is problematic to infer patterns based on such small samples, it appears that the nonmidden deposits at 41CV413 contain at least two stratigraphically discrete Archaic components. This contention is supported by the

indeterminate dark brown, ground stem edges and base indeterminate light brown, indeterminate light brown indeterminate light brown Chert Type, Comments alternately beveled Gray-Brown-Green, expanding stem Table. 24. Classification, provenience, and metric attributes for dart points from Analysis Unit 2 nonmidden deposits 14.8 15.5 15.3 16.80.0 Base Width 15.3 0.0 $18.5 \\ 20.0$ 14.5Haft Width 15.210.6 $18.9 \\ 19.2$ 0.0 Haft Length 28.60.0 0.0 Blade Width Гепgth $48.1 \\ 39.8$ 0.0 0.0 Blade Тһіскпезя 7.8 $8.1 \\ 8.4$ Maximum Maximum AtbiW 0.0 0.0 0.0 37.6Гепgth 67.059.015.832.5Maximum Feature I = I<u>~</u> Test Unit 1 (73 cm) Test Unit 9 (80–90 cm) Test Unit 9 (70–80 cm) Test Unit 1 (60–70 cm) Test Unit 1 (86 cm) Test Unit (depth) Martindale (n = 1)Untypeable (n = 1)Bulverde (n = 2)Untyped (n = 1)Point Type

typology of two time-diagnostic projectile points found in a clearly stratified context in Test Unit 1. In this unit, a Bulverede dart point was recovered at 73 cm in the stratigraphic zone below burned rock midden Feature 1. This suggests a date near the beginning of the Late Archaic period for these deposits. Below this, a discrete occupation zone (Feature 7) contained an Early Archaic Martindale dart point, although its precise association with this feature, radiocarbon dated to the Middle Archaic period, is unclear. It is not possible to determine from this limited sampling whether the Early to Middle Archaic occupations predate all or only portions of the midden development, which clearly continued through much of the Late Archaic.

Cultural Activities

Two of the four features excavated from nonmidden contexts are clearly rock-lined hearths or earth ovens, probably related to cooking and processing activities of some kind. The cultural materials associated with these features are too sparse to identify specific processing activities. However, the paucity of faunal remains recovered from Feature 10 and the lack of faunal remains from Feature 5 suggest that processing animal resources was of minimal importance, and that plant processing, instead, was their primary function.

In contrast, a possible dispersed hearth within the Feature 7 occupation zone contained the highest density of faunal remains recovered from nonmidden contexts. A high percentage of the identifiable specimens represent deersized mammals and ungulates, a high percentage are burned, and a significant portion are

spirally fractured (see Appendix B). The faunal remains from this feature suggest that activities in this occupation zone may have been related to animal processing.

Feature 11 contained negligible quantities of cultural materials, and the form of the feature was inconclusive. Though limestone rocks may have been gathered together and heated in place, the nature of the activities that took place are unknown.

A more-refined understanding of the features and cultural materials from nonmidden deposits depends on the chronological and functional relationships of the midden and nonmidden components. Based on these limited investigations, no definitive interpretation is offered, but there are at least two possible relationships. The first possibility is that nonmidden deposits may simply predate the cultural activities that led to midden development. In this case, features and artifacts from nonmidden contexts represent earlier and different resource exploitation strategies compared to those represented by the midden deposits. The second possibility is that the nonmidden deposits are contemporaneous with the early period of midden development and represent peripheral or totally different activities. In some cases, midden accretion covered and sealed these earlier cultural activities (e.g., Features 7 and 10), while in others, the early cultural activities remain well outside the midden deposits (e.g., Features 5 and 11). In either case, the activities represented by nonmidden deposits could be contemporaneous and complementary to the intensive plant cooking activities represented by midden use.

THE CLEAR CREEK GOLF COURSE SITE: UNDERSTANDING CENTRAL TEXAS BURNED ROCK MIDDENS

Douglas K. Boyd and Gemma Mehalchick

7

"Middens are complex, accumulative, episodic, multicausal phenomenon that, characteristically, formed over long spans of time on stable land surfaces" (Black et al. 1997:271). As with many such features across the vast region known as central Texas, this statement seems to accurately sum up the large burned rock midden complex at the Clear Creek Golf Course site. Numerous discussions have centered on burned rock middens for almost nine decades of Central Texas archeology (Abbott and Trierweiler 1995a; Black 1985; Black et al. 1997; Black et al. 1998; Collins 1991; Creel 1986; Hester 1970, 1971, 1991; Honea 1962; Howard 1983, 1991; Kelley and Campbell 1942; Kleinbach et al. 1999; Pearce 1919, 1938; Peter 1982; Prewitt 1976, 1981, 1985; Quigg and Ellis 1994; Sorrow 1969; Weir 1976; Wilson 1930). Although excavation of these features has yielded substantial amounts of cultural materials, isolating interpretable, time-specific events (i.e., features or coherent artifact assemblages) in seemingly homogeneous midden deposits has proven difficult. Although there is still considerable disagreement about the range of variability in the form and function of middens, most archeologists now agree that the primary research focus should be to create new and innovative investigative strategies aimed at understanding how, why, and when they formed. One way is to identify and investigate discrete internal features (i.e., materials that can be reasonably inferred to represent specific cultural events) within the deposits and contemporaneous cultural components and activities away from the midden. The vast majority of internal features identified to date represent cooking facilities (e.g., remnants of

earth ovens); these can yield valuable information about chronology and subsistence.

In their treatise on hot rock cooking, Black et al. (1997) analyze four midden sites, a synthesis of Central Texas middens, and recommendations for future investigations of these features. In this report, published chronometric data from 35 Central Texas middens correspond to the Early Archaic through Late Prehistoric periods. Sampling and preservation biases are discussed, but the dates indicate that middens primarily accreted after A.D. 1 and that the intensity of midden use peaked during the Late Prehistoric period. This evidence seriously challenges the concept of an Archaic or Pedernales hevday of midden formation with a Late Prehistoric veneer, an idea that is well entrenched in previous archeological literature (Black et al. 1997:271-284).

Investigations of burned rock middens at Fort Hood in the 1990s (Abbott and Trierweiler 1995a; Kleinbach et al. 1999; Mehalchick et al. 2000; Trierweiler 1996) revealed new information. One focus was on the difference between burned rock mounds and middens. Most middens are buried in aggrading slopes, toeslopes or alluvial terraces, and these features are considerably larger and substantively different from isolated burned rock mounds typically found in upland settings. Midden activities were common during the Late Archaic through Late Prehistoric (Austin phase) periods, and discrete internal features—from hearths to ash lenses to a carbonized post—have been encountered in many of the middens. In contrast, little is known about off-midden activities because most investigations have targeted midden deposits rather than nonmidden areas.

The testing results indicate that the Clear Creek Golf Course site has tremendous potential to yield valuable data about midden formation and associated activities. Based on trench exposures and surface manifestations, it appears that one large midden area extends approximately 135 m northeast-southwest by 70 m northwest-southeast, or 9,450 m². Although three separate feature numbers (Features 1–3) were assigned to different parts of this large complex, the feature may be, for all practical purposes, a single large burned rock midden. In many ways, the midden at the Clear Creek Golf Course is typical of the very largest middens found in Central Texas and scattered across Fort Hood. Large middens on Fort Hood (i.e., 2,500 m²) are found on alluvial terraces, alluvial fans, and colluvial toeslopes at 10 sites (Table 25), including the golf course. Most of these large middens are rich in artifacts (in terms of frequency and diversity of types) and represent intensively occupied localities. The total hand excavation volume at these large middens ranges from 0.62 to 3.40 m³. Thus, the midden at 41CV413 is one of the more intensively investigated large burned rock middens at Fort Hood.

In their treatise, Hot Rock Cooking on the Greater Edwards Plateau, Black et al. (1997) show that researchers have not adequately investigated the large burned rock middens of Central Texas. The authors (Black et al. 1997:289) note that much work has been done on Fort Hood but state that, "The Fort Hood work notwithstanding, we again repeat our assertion that not a single truly large burned rock midden has ever been thoroughly investigated and reported in detail." They argue that archeological researchers must try new strategies that aim to define the internal structure of burned rock middens, and that we will never fully understand Central Texas prehistory until we understand burned rock middens of all shapes and sizes, including the large and complex middens such as the one at the Clear Creek Golf Course site reported herein. Black et al. (1997:307–314) suggest that we will never learn much about the prehistoric peoples and activities that created burned rock middens until we do large-scale excavations using innovative, research-oriented, and cost-effective techniques. They contend that we must maximize what we learn relative to the effort expended by identifying and extracting meaningful information from

occupation zones around middens and from internal features within middens.

Subarea B at the Clear Creek Golf Course site contains an extensive burned rock midden deposit, internal hearths or earth oven cooking features, and copious amounts of cultural debris from the surface to a depth of over 100 cm, along with significant nonmidden cultural features and associated artifacts to 130 cm (Figure 20). The anthropogenic midden deposits formed on gravelly Fort Hood channel fill that stabilized around 2800 B.C. This site setting mirrors that of several other middens on the installation that also formed on old channel gravel bars (Table 26). For example, 41CV117, Subarea C, located on Clear Creek approximately 3 km downstream from 41CV413, contains a similar midden in a similar geomorphic setting on top of a Fort Hood-age gravel deposit. No discrete internal features were encountered during testing (Trierweiler 1996:223-233), but only four trenches were excavated on this large and severely looted midden (ca. 210x75 m or 15,750 m²). The pattern of burned rock middens formed atop Fort Hood alluvial gravel deposits appears to be a real cultural phenomenon. The evidence suggests a rather simple explanation that these middens, all of which grew to be quite large, were intentionally started on exposed gravel facies because they provided an immediate source of rocks for use in cooking activities. The river-worn limestone cobbles underlying the cultural deposits at 41CV413, Subarea B, were definitely used as hearthstones, as well as ground stones, and provided an abundant source of rocks that allowed the midden to develop over many hundreds of years (see Chapter 4).

Near the center of the Clear Creek burned rock midden, four internal features were encountered within a 20-m area (see Chapter 5). Chronometric data from two hearths (see Table 11) and most diagnostic dart points indicate intensive use of the area during the early half of the Late Archaic period, specifically the Bulverde and Pedernales intervals (see Collins 1995). Although undated, an ash lens most likely correlates to the Late Archaic period and may be contemporaneous with one of the excavated hearths. Food processing activities are evidenced by the presence of ground stone tools, charred macrobotanical remains (albeit limited in number), vertebrate faunal remains (including spirally fractured bones), and a small

Table 25. Summary and comparison of large (>2,500 m²) burned rock middens on Fort Hood

						Volume of	Total		-
	ature	Estimated Midden	Estimated Midden		Test Units in Midden	Volume of Excavated Midden	Midden Artifacts	Artifact Density	
Site	Fe	Size (m)	$Area (m^2)$	Landform	(#)	Deposits (m ³)	(#)	(# per m ³)	Reference
41BL154	H	150 x 50	7,500	alluvial fan	7	1.70	1,605	944.1	Abbott and Trierweiler 1995a: Table 5.2 Trierweiler 1996:Tables 5.2, 8.1
41BL155	1	90x30	2,700	terrace	4	3.40	6,665	1960.3	Mehalchick et al. 1999:51, Tables 7, 50
41CV46	П	140x80	11,200	alluvial fan	က	0.95	1,942	2044.2	Trierweiler 1996:Tables 5.19, 8.1
41CV48	2	09x09	3,600	alluvial fan	1	0.62	2,081	3356.5	Trierweiler 1996:Tables 5.23, 8.1
41CV117	1	$250\mathrm{x}120$	30,000	terrace	က	1.60	641	400.6	Trierweiler 1996:Tables 5.36, 8.1
41CV174	П	110x50	5,500	terrace-toeslope	1	0.56	51	91.1	Abbott and Trierweiler 1995a: Table 6.41 Trierweiler 1996:Table 8.1
41CV413	1, 2	135x70	9,450	terrace	8 (3)*	1.98	3,528	1781.8	this report
41CV481	1, 5	80x60	4,800	terrace-toeslope	61	1.07	276	257.9	Trierweiler 1996:Tables 5.66, 8.1
41CV1235	п	130x45	5,850	terrace-toeslope	2	1.20	757	830.8	Kleinbach et al. 1999:Tables 25, 90

* While eight test units were excavated at 41CV413, only three provide complete samples of artifacts from the midden deposits. The excavation volume, number of artifacts, and artifact density are calculated based only on Test Units 1, 3, and 4 (see Table 12).

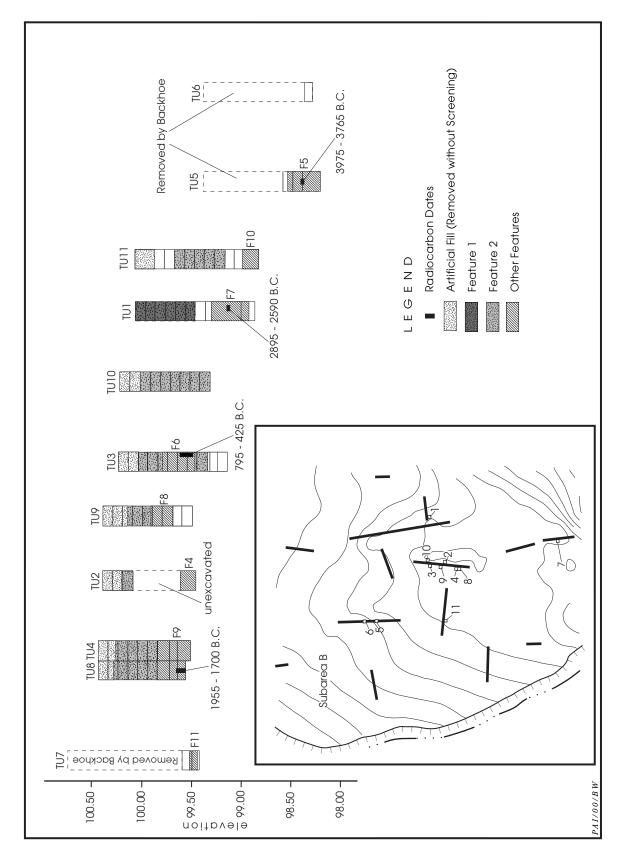


Figure 20. Cultural stratigraphy of the Clear Creek Golf Course site, 41CV413, Subarea B.

Table 26. Burned rock middens on Fort Hood formed in West Range alluvium above gravelly channel fill substrates of Fort Hood alluvium

Site	Midden Feature	Reference
41CV117, Subarea C 41CV184 41CV1048 41CV1133 41CV1235	Feature 1 Feature 1 Feature 1 Feature 1	Trierweiler 1996:223–233 Trierweiler 1996:239–251 Kleinbach et al. 1999:262–268 Kleinbach et al. 1999:282–289 Kleinbach et al. 1999:175–188

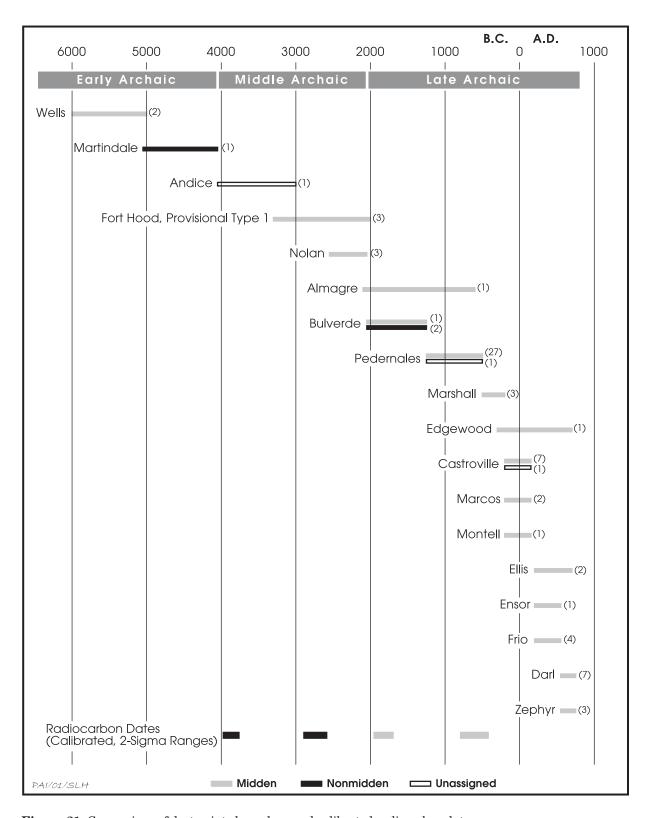
quantity of mussel shells. Present near the base of the midden and intruding into the underlying sterile sediment, a human burial (undated) probably corresponds with the inception or earliest period of midden formation, most likely during the Middle Archaic.

Away from and more deeply buried than the midden, four burned rock features are encapsulated in fine-grained Fort Hood alluvium. Dates obtained from two hearths (see Features 5 and 7 in Table 11) reveal occupation during the Middle Archaic period, before and during the time of T_{1a} stabilization. Although no relationship has been established between these temporally older cultural deposits and the midden, portions of the midden may have developed concomitantly with these early nonmidden activities. The two hearths contained only indeterminate charred wood and sparse cultural remains. Although they most likely represent cooking facilities, it is unclear what may have been processed. An occupation zone with a possible dispersed hearth consisted primarily of burned rocks and vertebrate faunal remains, of which many were spirally fractured. This suggests that game processing was an associated activity. The fourth feature, a burned rock concentration, produced no interpretable associated remains.

When the midden and nonmidden chronological evidence are compared, as in Figure 21, it appears that the activities overlap and span a considerable amount of time—2,000 to 4,000 years for the nonmidden activities and 5,000 to 7,000 years for the midden deposits. The two nonmidden radiocarbon dates are substantially earlier than the two midden-associated dates, but this evidence is definitely skewed by sampling. Only the deeper and obviously intact nonmidden

features were dated, and the overall nonmidden excavation sample was very small relative to the large size of Subarea B. Hence, it is likely that if more nonmidden testing were done and more features would be found and dated, the midden and nonmidden activities would prove to be contemporaneous throughout the last 5,000 to 7,000 years. The temporal assignments of the projectile points also reflect a

similar scenario but suggest that occupations began in the Early Archaic (Table 27; see Figure 21). A total of 74 dart points were identified to type, and 18 named types are represented. Each type was assigned a use range based primarily on a limited number of discrete archeological components (i.e., gisements) defined by Collins (1995). These dates are subject to substantial revision as new finds in good archeological contexts are made, but for now they reflect the best guess of the actual use range of each point type. Cultural activities began in the area during the Early and Middle Archaic, between 6000 and 2000 B.C., but these activities were minimal. It is likely that the cooking activities that began the formation of the midden occurred during the Middle Archaic period. Cultural activities intensified around 2000 B.C. and continued throughout the Late Archaic period. Based strictly on the points recovered, the Clear Creek midden falls into the old "Pedernales heyday" genre, and at least one midden-associated radiocarbon date falls squarely in this cultural interval. It is possible that cultural activities were, in fact, more-intensive during this time (i.e., more Pedernales people used the site). Alternatively, it is possible that rather than an increase in population or intensity of use, an increased emphasis on hunting activities accounts for the greater frequency of Pedernales dart points. It also is possible that the data are skewed to some degree by sampling bias. Different portions of the midden may have been used at different times by people using different dart points, and the testing data may be skewed by sampling an area where intensive Pedernales activities occurred. Notably, the total number of dart points dating after ca. 500 B.C. (n = 29) is roughly equal to the number of points dating to



 $\textbf{Figure 21.} \ \textbf{Comparison of dart point chronology and calibrated radio carbon dates}.$

Table 27. Chronology of identifiable dart points recovered

		Ch	Chronological Data		Points Recov	Points Recovered by Analysis Unit (#)	vsis Unit (#)
•		;	0	·	Midden	Nonmidden	
Point Type	Beginning Date	Ending Date	Reference	Provenience Yielding Identifiable Dart Points	$\begin{array}{c} ext{Deposits} \ ext{(AU 1)} \end{array}$	$egin{aligned} ext{Deposits} \ ext{(AU 2)} \end{aligned}$	Unassigned Collections
Wells	6000 B.C.	5000 B.C.	Elton Prewitt, personal communication 2000; Turner and Hester 1993	Backhoe Trench 2	2	I	I
Martindale	5050 B.C.	4050 B.C.	Collins 1995	Test Unit 1	I	1	I
Andice	4050 B.C.	3000 B.C.	Collins 1995	surface	I	I	1
Fort Hood Provisional Type 1	3300 B.C.	2000 B.C.	Kleinbach et al. 1999:337	Test Units 9, 11; Backhoe Trench 2	င	I	I
Nolan	2550 B.C.	2050 B.C.	Collins 1995	Test Unit 3; Backhoe Trench 2	6	I	I
Almagre	2100 B.C.	600 B.C.	Collins 1995; Turpin 1982	Test Unit 4	1	I	I
Bulverde	2050 B.C.	1250 B.C.	Collins 1995	Backhoe Trench 18; Test Units 1, 9	1	2	I
Pedernales	1250 B.C.	500 B.C.	Collins 1995	Test Units 1, 4, 8, 9, 10, 11; Backhoe Trenches 2, 18; surface	27	ſ	1
Marshall	500 B.C.	200 B.C.	Collins 1995	Test Units 8, 9; Backhoe Trench 2	3	I	I
Edgewood	300 B.C.	A.D. 700	Turner and Hester 1993	Backhoe Trench 2	1	I	I
Castroville	200 B.C.	A.D. 150	Collins 1995	Test Units 3, 4, 8, 10; Backhoe Trench 2; surface	7	I	1
Marcos	200 B.C.	A.D. 150	Collins 1995	Test Unit 4	2	ı	ı
Montell	200 B.C.	A.D. 150	Collins 1995	Test Unit 4	1	I	I
Ellis	A.D. 200	A.D. 700	Elton Prewitt, personal communication 2000	Test Unit 4	2	I	I
Ensor	A.D. 200	A.D. 550	Collins 1995	Backhoe Trench 2	1	I	I

Table 27, continued	pan							
		CF	Chronological Data		Points Reco	Points Recovered by Analysis Unit (#)	(psis Unit (#)	
					Midden	Midden Nonmidden		
Point Type	Beginning Date	Ending Date	Reference	Provenience Yielding Identifiable Dart Points	$\begin{array}{c} \text{Deposits} \\ \text{(AU 1)} \end{array}$	$\begin{array}{ccc} \text{Deposits} & \text{Deposits} \\ (\text{AU 1}) & (\text{AU 2}) \end{array}$	Unassigned Collections	
Frio	A.D. 200	A.D. 550	Collins 1995	Test Units 3, 10, 11; Backhoe Trench 2	4	I	I	
Darl	A.D. 550	A.D. 750	Collins 1995	Test Unit 9; Backhoe Trench 2	7	ı	ı	
Zephyr	A.D. 550	A.D. 750	Collins 1995; Turner and Hester 1993 Test Units 9, 10; Backhoe Trench	Test Units 9, 10; Backhoe Trench 2	က	I	I	
Totals					89	3	3	

the Pedernales interval (n = 27 to 30). Clearly, the midden was intensively used throughout the Late Archaic period, but current evidence seems to suggest that the cultural activities at this site virtually stopped by about A.D. 700–750. The possibility that Late Prehistoric activities occurred cannot be ruled out given the limited nature of the testing, but there is not a single arrow point or radiocarbon date to suggest that any Late Prehistoric peoples were at this site. The landform appears to have been a stable terrace for several thousand years, and there is no evidence that Late Prehistoric deposits were present but subsequently removed by erosion or construction of the golf course (see Chapter 4).

Despite having many of the contextual problems that characterize burned rock middens in Central Texas (see Black et al. 1997:270–271), the Clear Creek Golf Course site has a very high research potential. Although discrete and interpretable artifact assemblages cannot be sorted out from the general midden matrix, these deposits do contain internal features representing discrete cooking and other activities (e.g., the human burial). Although overall preservation of charred remains is not particularly good (i.e., the amount and diversity of charred macrobotanical remains is fairly low), sufficient charred woods are present for establishing chronology of internal features and general midden contexts through radiocarbon assay. Of particular note with regard to research potential, the midden deposits contain an abundance and broad diversity of animal bones useful for inferring subsistence activities and dating purposes.

The breakage patterns of the projectile points denote a campsite where broken points were brought back to camp, presumably still hafted, and subsequently discarded. Although 51.6 percent of the 91 recovered dart points are complete, the other half of the specimens are proximal fragments (36.3 percent) or other fragments (12.1 percent). The unmodified debitage is dominated by tertiary flakes (n = 3,516; 92 percent), with only minimal amounts of secondary (n = 240; 6.3 percent) and few primary (n = 65; 1.7 percent) flakes noted. This, along with the paucity of cores (only 1 was recovered), suggests that late-stage lithic reduction was the primary activity and that most chert brought to the site was already reduced to noncortical bifaces or large flakes.

Viewed together, the points and debitage suggest a base camp where late-stage manufacture and repair of hunting equipment occurred.

It is notable that the underlying Fort Hood gravel substrate is dominated by limestone and contains few chert cobbles. The closest sources of cherts are secondary gravel sources—gravel bars along Clear Creek and upland residual gravels. The nearest primary sources are Anderson Mountain Gray and Seven Mile Mountain Novaculite, west and southwest of the site. When the identifiable chert types are compared for the entire chipped stone artifact assemblage from the Clear Creek Golf Course site, the results are informative (Table 28). Only 11 chert types are identified in the assemblage, and the 4 most common types are Fort Hood Yellow, Heiner Lake Tan, Anderson Mountain Gray, and Heiner Lake Translucent Brown. Of these types, which account for 81 percent (n = 649) of the identifiable cherts, only Anderson Mountain Gray is found in close proximity to the site. None of the other three types are known to be found anywhere close to the site, although Kleinbach et al. (1999:377-380) note that some Heiner Lake cherts may occur outside the defined Southeast Range chert province. When the total assemblage is compared by source area, as in Figure 22, the majority of the cherts (i.e., 81 percent) seem to come from the North Fort and Southeast Range chert provinces. In contrast, only 18 percent of the cherts are from the two chert types known in the West Fort province (i.e., Anderson Mountain Gray and Seven Mile Mountain Novaculite). It is noteworthy that both of these types are generally grainier and of lower quality (i.e., less knapable) than all of the other identified types.

There were probably many factors that made the Clear Creek locality a favorite spot for camping over such a long period of time. The alluvial terrace was stable throughout the late Holocene and offered a large camping area on level ground, close to water but high enough that flooding was infrequent. This segment of the Clear Creek valley probably offered an abundance of plant and animal resources in the immediate vicinity. Riparian resources were available along Clear Creek, while upland resources were available just beyond the margins of the creek valley (i.e., the surrounding Killeen surface). Archeological evidence indicates that

Table 28. Summary of identified chert types in the chipped stone assemblage

Chert Type	Dart Points	Other Chipped Stone Tools	Unmodified Debitage	Totals	Percentage of Identified Cherts
WEST FORT CHERT PROVINCE					
Anderson Mountain Gray Seven Mile Mountain Novaculite	5 -	8 –	123 12	136 12	15.70 1.39
Subtotals	5	8	135	148	18.36
NORTH FORT CHERT PROVINCE					
Texas Novaculite Fort Hood Yellow Fort Hood Gray Gray-Brown-Green Owl Creek Black	- 8 5 4 6	- 15 5 4 7	8 192 1 11 75	8 215 11 19 88	0.92 24.83 1.27 2.19 10.16
Subtotals	23	31	279	341	42.31
SOUTHEAST RANGE CHERT PRO	VINCE				
Heiner Lake Tan Heiner Lake Translucent Brown	13 7	30 12	122 114	165 133	19.05 15.36
Heiner Lake Blue	_	_	18	18	2.08
Subtotals	20	42	254	316	39.21
COWHOUSE CHERT PROVINCE					
Cowhouse Dark Gray	_	1	_	1	0.12
Identified Chert Subtotals Indeterminate/Unidentified Subtotals	48 51	82 98	676 3,447	806 3,596	100.00
TOTALS	99	180	4,123	4,402	_

the site was used as a major base camp where cooking and grinding of plant foods, late-stage lithic reduction and tool manufacture, retooling of hunting equipment, and processing of killed animals took place. Assuming that the tremendous amounts of burned rock debris were generated—in large part but not exclusively—by cooking plant foods in earth ovens, gathering and processing these plants were very important activities. It is likely that most of the plants processed and cooked on site were obtained in close proximity (e.g., within a 5 km radius). One other primary attraction of this locality was the abundant source of limestone rocks in the form of channel gravels near the base of the valley

wall. These gravels were exposed when the midden formation began in Early to Middle Archaic times, and were probably exposed during most of the Late Archaic period. The gravels eventually became inaccessible, however, as the exposures slowly got covered over as midden deposits built up over thousands of years.

SITE ASSESSMENT AND RECOMMENDATIONS

In their study of Central Texas burned rock middens, Black et al. (1997) present a summary chapter entitled, "Why dig another burned rock

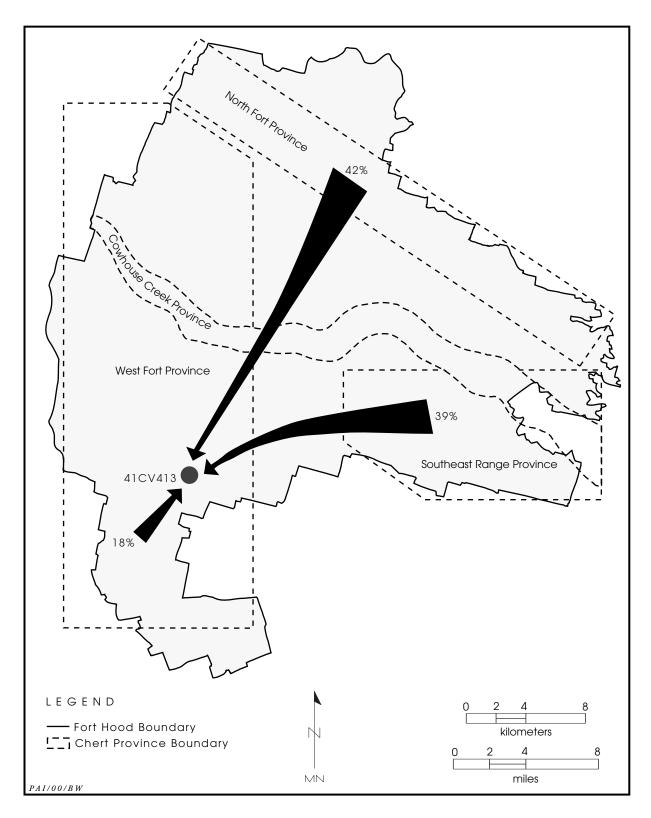


Figure 22. Map of chert source areas represented in the chipped stone assemblage.

midden?" It is a rhetorical question, and the authors of the chapter, Stephen Black, Darrel Creel, and Linda Ellis conclude that much remains to be learned from burned rock middens if we ask the right questions. The six broad research questions that they propose are:

When did middens accumulate?

How did middens form?

What foods were processed or cooked at middens?

How do middens function within the context of a site?

How can we explain midden-to-midden variation?

Why did middens form at specific places on the landscape?

These are all valid and important research questions, and the authors go on to propose a series of archeological investigation methods to work toward the goal of understanding Central Texas burned rock middens.

Going one step further, Black et al. (1997) propose that all burned rock middens are generally similar and were formed by the same set of cultural activities—repeated pit baking in centralized earth ovens. In contrast, researchers at Fort Hood (Abbott and Trierweiler 1995a; Kleinbach et al. 1995; Trierweiler 1994) and O.H. Ivie Reservoir (Treece et al. 1993) have made a distinction between two different types of large burned rock accumulations and hypothesize that burned rock mounds are significantly different in form and function from burned rock middens. As summarized by Kleinbach et al. (1995:767-776) for Fort Hood (see Boyd et al. 2000:40), burned rock mounds generally occur in nondepositional upland settings and have an obvious domed shape, and burned rock middens occur on toeslopes along valley walls and in alluvial-colluvial sediments within stream valleys. Middens are thick, amorphous deposits that lack significant relief and vary considerably in size and shape. Kleinbach et al. (1995) contend that the larger, irregular-shaped middens are much more complex and are not simply a series of intersecting mounds, as suggested by Black et al. (1997:288–289, 295–296). Based on the works of previous researchers at Fort Hood, Boyd et al. (2000:42) proposed testable

hypotheses for mounds and middens. The two hypotheses are repeated below.

Hypothesis 1 is that burned rock mounds are specialized plant processing localities where a nearby naturally occurring resource (s) was procured and cooked in an earth oven. It is likely that the processed resource was a specific plant or plants abundant in the upland setting where mounds are common. Mounds evolved from continued reuse of a single central earth oven that was rebuilt and reused many times. Mounds have a clast-dominated character with very little fine matrix; they appear to represent only one type of debris—material cleaned out and discarded from earth ovens—with few other items discarded in the mound of fire-cracked rocks.

Hypothesis 2 is that middens represent accumulations of fire-cracked rocks and artifacts resulting primarily from cooking plant foods in earth ovens, but also from dumping burned rocks and other debris generated by other cultural activities. Middens do not result from continued reuse of a single central earth oven, but they may result from use and reuse of many different earth ovens and other cooking features scattered throughout the midden matrix, along with secondary refuse (i.e., dumped materials) representing a wide range of other activities (e.g., stone boiling).

Hypothesis 2 is directly applicable to the large burned rock midden at the Clear Creek Golf Course site. Bearing in mind this hypothesis and the other research questions posed above, the archeological research potential of 41CV413, Subarea B, is very good. Testing demonstrates that this location has much to tell about the people who lived there through time and the cultural processes that formed large burned rock middens. The Clear Creek Golf Course site contains an abundance of archeological evidence useful for addressing research problems related to burned rock midden function and evolution, changes in cooking technologies and subsistence through time, and comparative studies of midden vs. nonmidden activities. Following the research design identified by Ellis et al. (1994) and summarized and expanded by Boyd et al. (2000), five fundamental research domains are identified as chronology, paleoenvironmental reconstruction, subsistence, technology, and sociocultural organization.

Chronology of cultural activities may be addressed through radiocarbon dating of

charred remains found in association with features, both internal features within the burned rock midden and nonmidden features. In the absence of charred remains associated with a particular feature, it may be possible to extract organic residues from burned rocks for radiocarbon dating. Radiocarbon dating of bones, well preserved in the midden, may also provide useful information. Amino acid racemization of snails may be used as a dating technique and to assess the integrity of deposits, but this applies only to the alluvial deposits in nonmidden areas. Amino acid racemization of snails from the midden is not warranted because these deposits are jumbled and lack contextual integrity and accidental heating of snails renders them useless for racemization analysis.

For information about paleoenvironmental reconstruction, the best evidence may come from nonmidden areas rather than the midden deposits. Stable isotope studies of faunal remains from the midden could yield interpretable data, but geoarcheological studies of natural-cultural stratigraphy in the nonmidden alluvial deposits are likely to be more informative. Radiocarbon dating, snail amino acid racemization studies, and isotope studies on sediments may provide evidence for defining changes in, and rates of, sediment deposition. Pollen is not likely to be well preserved at this site, but phytoliths may be.

Subsistence issues can be investigated in midden and nonmidden areas. The internal structure of the midden and functional inferences for internal features will reveal human subsistence activities at different times. Macrobotanical remains from internal features may provide important information. It is worth noting that although preservation of charred plant remains was found to be relatively poor in the features tested, preservation conditions may vary considerably between features within the same site. It is possible that some features with moderate to good preservation may be present. Faunal remains are relatively abundant throughout the midden, and obtaining a sample of identifiable bones could yield subsistence data. Important finds should be dated by radiocarbon assay. Features and artifacts in nonmidden areas are likely to be attributable to discrete cultural occupations, and the associated macrobotanical, faunal, and stone tool (chipped and ground) assemblages will

provide important subsistence evidence. Organic residues preserved on artifacts or rocks associated with specific features or occupations may provide important data.

As with subsistence, technology issues can be investigated in midden and nonmidden areas. Many technological aspects of cooking with hot rocks will be revealed through large-scale excavations aimed at identifying midden structure. Close examination of internal features may reveal information about construction and function (see Black et al. [1997:777–783] for suggested methods of feature investigation and recording). Intensive comparative analyses of artifact assemblages (e.g., functional studies of chipped and ground stone tools and features in nonmidden areas) will also provide data for addressing technology issues.

There will be limited opportunities to address research questions related to socio-cultural organization using data from the Clear Creek Golf Course site. The human burial that was found suggests that more may exist at the site. However, under current federal laws and policies, it is unlikely that human burials would be fully excavated or studied to reveal mortuary patterns or other social aspects of the person's life.

Using the prehistoric site significance criteria developed for Fort Hood by Ellis et al. (1994), Subarea B of 41CV413 is recommended as eligible for listing on the National Register of Historic Places under Criterion D. Although portions of the burned rock midden were seriously damaged in 1999, significant deposits remain intact and have a high research potential. In addition, the presence of an intact human burial below the midden means that Subarea B is automatically National Register eligible (see Mehalchick et al. 1999:22-23). Archeological testing also revealed intact cultural deposits and features in nonmidden contexts that clearly meet the NRHP significance criteria and can yield important information through archeological investigation.

A data recovery plan proposed for 41CV413, Subarea B by Boyd (1999a) has two primary objectives (see Appendix F). The first objective is examining the structure and formation of the burned rock midden deposits, while the second goal is to obtain a limited sample of features and artifacts nearby that represent contemporaneous nonmidden activities. The proposed

work is a comprehensive, multidisciplinary strategy that will examine a portion of the extensive midden deposits and sample the nonmidden cultural sediments while leaving large portions of the site's cultural deposits intact and undisturbed. The proposed work includes (1) a proton magnetometer survey of the midden area before excavation, (2) mechanical stripping to provide horizontal and vertical exposures in the midden and nonmidden areas, (3) identification and hand excavation of discrete features or activity areas, (4) extensive sediment sampling and flotation, (5) sampling and analysis of burned rocks, and (6) a range of laboratory techniques for analyzing various samples and cultural materials.

The initial targeted midden deposits will be the area on either side of Backhoe Trench 2, where several internal features (i.e., Features 6, 8, and 9) have already been identified and examined within the general midden matrix (Feature 2). Mechanical stripping is an efficient and innovative means of searching for internal features that represent discrete activities within the homogeneous and jumbled midden matrix. Hand excavations would then concentrate on investigating as many internal features as possible. The number and placement of target areas, or excavation blocks, and the total volume to be mechanically or manually excavated cannot be predetermined because the number of internal features requiring hand excavation is unknown. However, this plan proposes a minimum area of five 4.5x15-m block midden excavations for a total area of 338 m² and an estimated volume of 338 m³ (average depth of excavations is 1 m). Most of this area, 313 m³ (93 percent), would be slowly stripped by machine (i.e., a Gradall), while approximately 25 m³ would be hand excavated. The amount of midden area investigated under this plan would be less than 4 percent of the total area of the midden (estimated to be 9,450 m²).

The proposed data recovery plan calls for nonmidden excavations to include at least one 4.5x15-m excavation block—an area of 67.5 m²—in the vicinity of Backhoe Trench 10. Machine stripping will be done to remove overburden and sterile zones between stratified cultural layers, and 20 m³ of hand excavations will be done to sample the targeted cultural zones.

The data recovery plan proposed here for the Clear Creek Golf Course site (see Appendix F)

focuses primarily on the burned rock midden the most prominent feature on the site and an excellent example of a large (i.e., >2,500 m²) burned rock midden in Central Texas. The combined use of mechanical stripping and hand excavations to target archeological features is not new and has been used effectively in many contexts for years. However, because machine excavation is destructive, site-by-site decisions on the use of machines must be made and must take a variety of factors into consideration (e.g., the threat of damage to the site, the research goals of the investigation, the time and money available for the investigation, and the archeological integrity and research potential of the deposits being removed by machines). The use of mechanical stripping and hand excavations on large burned rock middens in Central Texas is justifiable because a century of archeological research on middens has shown us four things. First, burned rock middens in Central Texas are generally composed of a single zone or layer of debris characterized by a homogenous matrix of fire-cracked limestone rocks mixed with varying amounts of charcoal-stained sediment and artifacts.

Second, the general matrix comprising burned rock middens has been repeatedly proven to be completely jumbled, even when the middens are more than a meter thick. Diagnostic projectile points and radiocarbon dates from point-provenienced organic samples are frequently out of stratigraphic sequence and demonstrate that general midden matrix has virtually no stratigraphic or contextual integrity. Researchers have yet to define any meaningful stratigraphic layers or cultural zones within a single zone of general midden matrix.

Third, discrete and meaningful cultural features are commonly encapsulated with the general matrix of burned rock middens. Such internal features represent definable cultural activities that took place at one point in time. Each specific activity likely obliterated evidence of the activities that preceded it. Consequently, the in situ remains of specific cultural events are often very subtle and are recognizable as concentrations of rocks that are slightly different in type, size, or characteristics (e.g., fracture patterns) from the surrounding rocks or concentrations of fine-grained matrix that somehow differ from the matrix around them. The most commonly identified internal features

within middens are basin-shaped pits lined with larger burned rocks (compared to the burned rocks comprising the general matrix); these are considered to be the remnants (i.e., bottom linings) of earth ovens used for cooking. Other examples of features found within middens include lenses of charcoal-stained sediment or ash that may represent dump episodes from cleaning out earth ovens, circular clusters of flat rocks that may be surface hearths, unusual concentrations of artifacts that may represent dumps of knapping debris, and even occasional stains representing post holes or burned posts. Other researchers have hypothesized that some of the burned rocks in middens may represent dump episodes related to stone boiling or other types of cooking and heating activities.

For these reasons, most Central Texas archeological researchers in recent years have focused their burned rock midden investigations on defining midden structure by identifying and studying internal features. Detailed studies of general midden matrix are productive only when aimed at recognizing the internal features, which then become the target of intense scrutiny. Diagnostic projectile points found in general midden matrix contexts may provide limited chronological information for the site as a whole, but no other materials (e.g., other stone artifacts, bones, botanical remains) can be linked to them. Detailed analyses of nondiagnostic artifacts (e.g., stone tools and debitage) from the same midden matrix contexts are usually fruitless because the materials do not represent meaningful components. One exception would be a single midden zone with sufficient data to demonstrate that it had accumulated within a very short span of time, but these are likely to be rare occurrences. Because the large burned rock middens of Central Texas represent accumulations over very long periods of time, usually many hundreds and often

thousands of years, and because the very nature of the human activities that form middens disturbs the earlier deposits, it is difficult to isolate any meaningful groupings of cultural materials other than the internal features.

The fourth and final thing we have learned in a century of midden research is that smallscale excavations (i.e., mechanical excavation of a few backhoe trenches and hand excavation of isolated test units or small excavation blocks) are not likely to provide sufficient information to identify the structure of burned rock middens or adequately address the types of research questions posed earlier in this chapter. These small-scale excavations are an important cultural resources management tool and are essential for defining a site's research potential, but they make few meaningful contributions to the long-term goals of reconstructing prehistoric lifestyles through time and across space. Perhaps the most effective data recovery strategy is to focus on identifying and investigating discrete internal features over an entire (or at least a large portion of a) burned rock midden. Since the burned rock midden symposium was held in Austin in 1988, archeologists have realized that we must look closely at the small details to understand the microscale of midden structure but do it on a large scale. The ultimate goal is understanding the big patterns of the middens themselves and the diversity of midden structure and function on a regional scale (Black et al. 1997:311-312; Collins 1991:17). An innovative approach that combines the use of machine and hand excavations over large areas is proposed (see Appendix F) as the best way to address the research questions relating to cultural activities and formation processes represented by the large burned rock midden at the Clear Creek Golf Course site.

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APPENDIX A: Soil Stratigraphic Descriptions

Karl W. Kibler

Backhoe Trench 1

Zone 1, 0–49 cm, Black (7.5YR 2.5/1, moist); silty clay loam; friable; weak fine blocky subangular structure; common snail (*Rabdotus* sp.) shells; common burned rocks; abrupt wavy lower boundary. Anthropogenically modified Fort Hood/West Range alluvium, A horizon.

Zone 2, 49–89 cm, Very dark grayish brown (10YR 3/2, moist); very gravelly silty clay loam; friable; weak fine blocky subangular structure; abrupt wavy lower boundary. Fort Hood alluvium, Bw horizon.

Zone 3, 89-126+ cm, Yellowish brown (10YR 5/4, moist); very gravelly clay loam; friable; structureless; gravel consists of rounded and poorly-sorted clasts; lower boundary not observed. Fort Hood alluvium, C horizon.

Backhoe Trench 8 (north end of trench)

Zone 1, 0–34 cm, Very dark grayish brown (10YR 3/2, moist); clay loam; firm; moderate fine blocky subangular structure; few dispersed matrix-supported gravels; abrupt smooth lower boundary. Fort Hood/West Range alluvium, A horizon.

Zone 2, 34–54 cm, Very dark gray (10YR 3/1, moist); clay loam; firm; moderate medium blocky angular structure; few burned rocks; few dispersed matrix-supported gravels; abrupt smooth lower boundary. Fort Hood alluvium, 2Ab horizon.

Zone 3,54-70 cm, Dark brown $(7.5YR\ 3/2, moist)$; gravelly clay loam; firm; moderate medium blocky angular structure; abrupt smooth lower boundary. Fort Hood alluvium, 2Bwb horizon.

Zone 4, 70-157 cm, Upward fining deposit of well-sorted, subrounded gravels to brown (10YR 4/3, moist) sandy clay loam; firm; weak medium prismatic breaking to moderate medium blocky angular structure; 11-cm-thick gravel bed (gravel consists of subrounded, moderately-sorted clasts) at top of zone; common $CaCO_3$ filaments on ped faces; abrupt smooth lower boundary. Fort Hood alluvium, 2BCb horizon.

Zone 5, 157–240+ cm, Brown (7.5YR 4/3, moist); clay; very firm; moderate coarse prismatic breaking to strong medium blocky angular structure; few dispersed matrix-supported gravels; lower boundary not observed. Fort Hood alluvium, 3Btb horizon.

Backhoe Trench 8 (south end of trench)

Zone 1, 0–24 cm, Artificial fill. AC horizon.

Zone 2, 24–57 cm, Very dark gray (10YR 3/1, moist); silty clay loam; firm; moderate medium blocky subangular structure; few dispersed matrix-supported small gravels; clear smooth lower boundary. Fort Hood alluvium, 2Ab horizon.

Zone 3, 57–92 cm, Brown (7.5YR 4/2, moist); clay loam; firm; moderate medium blocky angular structure; common clay films of ped faces; few dispersed matrix-supported gravels; clear smooth lower boundary. Fort Hood alluvium, 2Bwb horizon.

Zone 4, 92–177+ cm, Brown (7.5YR 4/3, moist); clay; very firm; strong coarse prismatic structure; clay films on ped faces; lower boundary not observed. Fort Hood alluvium, 2Btb horizon.

Backhoe Trench 10

Zone 1, 0–21 cm, Artificial fill. AC horizon.

Zone 2, 21–48 cm, Very dark gray (7.5YR 3/1, moist); gravelly clay loam; firm; moderate fine blocky subangular structure; common burned rocks; abrupt wavy lower boundary. West Range alluvium, Ab horizon.

Zone 3, 48–124 cm, Dark grayish brown (10YR 4/2, moist); gravelly sandy clay loam; firm; moderate

fine blocky subangular structure; 20-cm-thick gravel bed at base of zone, gravel is clast-supported, subrounded to rounded, and moderately-sorted; abrupt wavy lower boundary. West Range alluvium, Bwb horizon.

Zone 4, 124–154 cm, Yellowish brown (10YR 5/4, moist); sandy clay loam; firm; moderate medium blocky angular structure; few dispersed matrix-supported small gravels; common CaCO₃ filaments; clear smooth lower boundary. Fort Hood alluvium, Bwkb horizon.

Zone 5, 154–189 cm, Dark grayish brown (10YR 4/2, moist); silty clay loam; firm; moderate fine blocky angular structure; common $CaCO_3$ filaments; gradual smooth lower boundary. Fort Hood alluvium, 2Akb horizon.

Zone 6, 189–239 cm, Yellowish brown (10YR 5/4, moist); clay loam; firm; moderate fine blocky angular structure; few dispersed matrix-supported rounded gravels (probable stringer since displaced or disturbed); common CaCO₃ filaments; clear smooth lower boundary. Fort Hood alluvium, 2Btkb horizon.

Zone 7, 239–379+ cm, Light yellowish brown (10YR 6/4, moist); silty clay loam; firm; moderate medium blocky angular structure; few matrix-supported small rounded gravels (probable stringer since displaced or disturbed); lower boundary not observed. Fort Hood alluvium, 2Cb horizon.

Backhoe Trench 13

Zone 1, 0–28 cm, Dark gray (10YR 4/1, moist); clay loam; very firm; weak fine blocky subangular structure; clear smooth lower boundary. Ford alluvium, A horizon.

Zone 2, 28–84 cm, Dark gray (10YR 4/1, moist) to very dark gray (10YR 3/1, moist); clay loam; very firm; moderate medium blocky angular structure; common matrix-supported subrounded gravels (probable stringer since displaced or disturbed); abrupt smooth lower boundary. Ford alluvium, AB horizon.

Zone 3, 84–126 cm, Very dark grayish brown (10YR 3/2, moist); sandy clay loam; friable; moderate fine blocky angular structure; common matrix-supported small rounded gravels (probable stringer since displaced or disturbed); clear smooth lower boundary. West Range alluvium, Bw horizon.

Zone 4, 126–268 cm, Dark grayish brown (10YR 4/2, moist); sandy clay loam; friable; moderate fine blocky angular structure; common matrix-supported small rounded gravels; abrupt smooth lower boundary. West Range alluvium, C horizon.

Zone 5, 268–320+ cm, Clast-supported, rounded gravels. West Range alluvium, C2 horizon.

Backhoe Trench 15

Zone 1, 0–13 cm, Very dark gray (10YR 3/1, moist); clay; firm; weak fine blocky subangular structure; abrupt smooth lower boundary. Ford alluvium, A horizon.

Zone 2, 13–33 cm, Black (10YR 2/1, moist); clay loam; firm; moderate fine blocky angular structure; abrupt wavy lower boundary. Ford alluvium, AB horizon.

Zone 3, 33–51 cm, Brown (10YR 5/3, moist); gravelly mud; firm; structureless; abrupt wavy lower boundary. Ford alluvium, C horizon.

Zone 4, 51-125 cm, Very dark grayish brown ($10YR\ 3/2$, moist); clay loam; firm; moderate medium blocky angular structure; bed of coarse sand at 68-75 cm; clay films on ped faces; clear smooth lower boundary. West Range alluvium, 2Ab horizon.

Zone 5, 125-161 cm, Dark grayish brown (10YR 4/2, moist); clay loam; firm; moderate medium blocky angular structure; clay films on ped faces; abrupt wavy lower boundary. West Range alluvium, 2Bwb horizon.

Zone 6, 161–175+ cm, Clasted-supported poorly-sorted rounded gravels. West Range alluvium, C horizon.

APPENDIX B: Analysis of Vertebrate Remains from the Clear Creek Golf Course Site (41CV413, Subarea B)

Brian S. Shaffer Zooarcheology Laboratory, Institute for Applied Sciences, North Texas State University

Analysis of the vertebrate faunal remains from 41CV413, Subarea B, was conducted to identify the taxa present in the assemblage and assess the condition of the assemblage. Excavated materials and those recovered through flotation were also compared. The following results were noted: no unexpected taxa were recovered, taphonomic impacts influenced the condition of the remains, and flotation yielded additional taxa not otherwise recovered.

METHODS

Specimens were analyzed using the University of North Texas, Institute of Applied Sciences Zooarchaeology Laboratory comparative collection. Identifications were made based on visual comparison with these specimens. Identifications that were equivocal were either taken to the next higher level (e.g., from genus to family level) or were given a "c.f." prefix to indicate that the specimen compared favorably with the taxon but that identification was not certain.

Attributes were recorded using a vertebrate faunal analysis coding system (Shaffer and Baker 1992) and were tabulated by computer. Attributes recorded included taxon, element, portion of element, siding, aging, weathering, breakage, burning, gnawing, cut marks and location, and chemical dissolution (acid etching). A comments field was added to record other observations.

The remains were tabulated using two methods. The number of identified specimens (NISP), or simple specimen count, was tabulated for each category of identification (Table 29). Additionally, the NISP by feature is presented in Table 30. The minimum number of individuals (MNI) was computed treating the site as a single aggregate based on element, portion of element, and aging criteria for each unique taxonomic group, usually at the genus level (Table 31).

Taphonomic information was recorded for each specimen, including both natural and cultural processes (Tables 32 and 33). Weathering was recorded as light or heavy depending on the amount of damage to the bone's exterior resulting from exposure. Light weathering was recorded for specimens that had undergone slight alteration but essentially still had their surfaces intact. Bones with fine line cracking and exfoliation were the specimens in the worst

condition; these were recorded as having heavy weathering. Breakage categories were unbroken, angularly fractured, or spirally fractured. Angular fractures are produced in bones that usually do not spirally fracture (e.g., fish bone, cranial elements, and turtle shell) and in bones that have lost their collagen (Johnson 1985). Spiral fractures are most common in long bones and occur when the bone still contains collagen (Johnson 1985). Often, spiral fractures are produced as a result of intentional breakage of the bone for the removal of the marrow or for processing into grease (Lintz 1976:87-88). This intentional breakage is often produced by percussion, resulting in impact marks on the bone (Johnson 1985). These were noted as well.

Burning categories were unburned, charred (burned black), or calcined (burned white). Charring results from incomplete combustion of the bone, whereas calcination is a more complete burning of the bone. Both forms were observed in the assemblage. Although these categories appear to be clear cut, in this case they were not. It was not always readily apparent if a bone was burned or simply stained. Several specimens were noted as having definitive burning on one portion of the bone, but very incomplete burning, resulting in a tanning or browning of the bone, on another portion. Bones that appeared noticeably darkened, but were not actually black in color, were still recorded as being burned. Occasionally, specimens from nonflotation contexts were intentionally broken to examine the interior for verification of burning status. This process provided the justification for recording darkened bone as burned.

Specimens recovered from flotation contexts were not assessed in the same manner because of their small size. The small specimens from these samples also often still exhibited a fine layer of dark matrix adhering to their surface, giving the impression that the specimens were burned when some were not. Removal of this matrix could only be accomplished through mechanical abrasion after specimens were dampened. Given the small sizes and large numbers of specimens, this process was not attempted. Except for calcined specimens, flotation sample burning should only be considered here as an estimate and not an absolute tabulation.

The only type of gnawing noted in the assemblage was rodent gnawing (n = 4). The lack of other identified forms, or identification

Table 29. Taxa recovered

		Nonflotation	Flotation	
Taxon	Common Name	Recovery	Recovery	NISP Total
Vertebrata	Vertebrates	184	1,220	1,404
Testudinata	Turtles	4	4	8
Emydidae	Water and box turtles	_	1	1
Serpentes	Snakes	1	_	1
Colubridae	Colubrid snakes	_	10	10
Aves (medium)	Medium birds	1	_	1
Aves (large)	Large birds	3	_	3
Mammalia (micro)	Shrew/mouse-sized mammals	_	3	3
Mammalia (small/medium)	Rabbit/canid-sized mammals	_	13	13
Mammalia (medium/large)	Canid/deer-sized mammals	267	116	383
Mammalia (large/very large)	Deer/bison-sized mammals	3	_	3
Mammalia	Mammals	_	1	1
Leporidae	Rabbits and hares	_	9	9
Lepus sp.	Jackrabbits	7	6	13
cf. Lepus sp.	Jackrabbits	1	_	1
Sylvilagus sp.	Cottontail rabbits	1	8	9
Rodentia (small)	Small rodent	_	1	1
Rodentia (medium)	Medium rodent	2	10	12
Geomys sp.	Pocket gophers	_	5	5
Neotoma sp.	Wood rats	1	2	3
Artiodactyla (medium)	Deer/pronghorn-sized ungulates	35	12	47
Artiodactyla (large)	Bison/cow-sized ungulates	_	1	1
Odocoileus sp.	Deer	8	2	10
Antilocapra americana	Pronghorn antelope	_	4	4
Totals		518	1,428	1,946

of gnawing on more specimens, may be due to the chemical dissolution of the surfaces of some specimens. More likely, however, rodent gnawing simply was not a significant taphonomic factor in this sample.

Chemical dissolution—apparently acid etching—was noteworthy in the sample but was not pervasive. Some specimens were unburned and apparently suffered no chemical damage, but others exhibited extensive surface damage. Burned specimens only rarely showed signs of chemical etching. As with burning, the recording of acid etching for the flotation samples can only be considered as an estimate; adhering matrix can mask surficial chemical damage, so the data are incomplete.

ANALYSIS RESULTS

Taxa Recovered

From Tables 29, 30, and 31, it is clear that the majority of taxa represented are common to the region (Davis and Schmidly 1994). With the exception of the Emydid turtle shell fragment, all of the taxa represented live in terrestrial habitats. Beyond the level of Vertebrata, most of the taxa are mammalian, with medium to large-sized mammal specimens dominating. Specific identified taxa include a diverse group of animals; deer and deer-sized artiodactyl remains dominate, followed by jackrabbits and medium-sized rodents (including gopher and rat).

Though not unexpected, the recovery of two taxa is interesting. Pronghorn antelope remains were recovered from nonfeature flotation in Test Unit 9. Four specimens were identified, all tooth fragments, from the same provenience. These specimens could not be refit but are potentially all from the same tooth. The proximal, anterior end of a proximal phalange belonging to a large artiodactyl also was recovered. The specimen was too fragmented for further identification, but it could be either bison or elk. The recovery of this element from Feature 6 in Test Unit 3 indicates that the specimen is of antiquity and

1,946 1,404 10 13 13 383 10 Totals 364 0 0 ∞ 0 0 0 4 70 0 0 0 0 က 0 0 0 Ø 91 0 0 481 Subtotals Nonmidden Deposits: Analysis Unit 2 Feature 11 က 1 က Feature 10 2 ro Feature 7 97 ∞ က 27 12 150 1 1 $^{\circ}$ 1 က 323 259 Н 43 1 $^{\circ}$ $^{\circ}$ 4 4 Nonfeature 313 1,4650 က က 6 0 6 11 9 10 က ∞ 0 1,040 31 Subtotals Midden Deposits: Analysis Unit 1 17* 250 5 Ю 4 Ø 292 4 Feature 9 Feature 8 16 I I 1 1 <u>~</u> 1 2 25I Feature 6 \vdash ı 330 31291 က 256 က 0 982 က $^{\circ}$ Ø 1 ∞ 1 1 Feature 2 455 ~ 4 29 7 2 Feature 1 28 32 Shrew/mouse-sized mammals Rabbit/canid-sized mammals Canid/deer-sized mammals Deer/bison-sized mammals Bison/cow-sized ungulates Water and box turtles Deer/pronghorn-sized Pronghorn antelope Rabbits and hares Cottontail rabbits Colubrid snakes Pocket gophers Common Name Medium rodent Medium birds Small rodent ungulates Jackrabbits Vertebrates Large birds Jackrabbits Wood rats Mammals Turtles Snakes * Includes one modified bone artifact. Deer Mammalia (small/medium) Mammalia (medium/large) Antilocapra americana Artiodactyla (medium) Artiodactyla (large) Rodentia (medium) Mammalia (micro) large/very large) Rodentia (small) Aves (medium) Sylvilagus sp. Odocoileus sp. cf. Lepus sp. Neotoma sp. **Pestudinata** Aves (large) Colubridae Geomys sp. Vertebrata Mammalia Mammalia Emydidae Serpentes Leporidae Lepus sp.

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Table 30. Taxa recovered by feature

Table 31. Taxa recovered by minimum number of individuals (MNI)

Taxon	Common Name	MNI
Emydidae	Water and box turtles	1
Colubridae	Colubrid snakes	1
Lepus sp.	Jackrabbits	3
Sylvilagus sp.	Cottontail rabbits	2
Geomys sp.	Pocket gophers	2
Neotoma sp.	Wood rats	1
Odocoileus sp.	Deer	2
Antilocapra americana	Pronghorn antelope	1

Table 32. Taphonomy from nonflotation and flotation recovery

Taphonomy	Nonflotation Recovery	Flotation Recovery	Totals
light weathering	$516 \\ 2$	1,428	1,944
heavy weathering		-	2
unbroken angular breakage spiral breakage impact fracture	4 263 251 1	27 1,228 173	31 1,491 424 1
unburned	335	602	937
charred or tanned	159	765	924
calcined	24	61	85
rodent gnawed	3	1	4
acid etched	185	8	193

is not likely that of modern cattle. Similarly, three specimens identified as large to very large mammal that were recovered from various depths may also be from bison or elk.

Taphonomy

The condition of the specimens as a whole was relatively good in terms of surficial preservation, with fragmentation the main problem affecting identifications. From the nonflotation sample, where results are considered most reliable, acid etching (chemical weathering of bones caused by acids in soils and plant roots and rootlets) was present on 185 (36 percent) of the 518 specimens recovered. In most cases, the etching marred the surfaces of the bones but did not completely obliterate surficial

features. Acid etching was not common across the site. Most of the etched bones (n = 182) were recovered from the nonflotation portion of Feature 2.

Fragmentation is a major taphonomic factor that precluded better identification of the faunal remains. This resulted in the majority of specimens being identifiable only as Vertebrata or medium to large Mammalia. In looking at the nonflotation-recovered fauna, it is

interesting to note that nearly half of the specimens (n = 251) were spirally fractured. Most of these specimens were quite small but were from medium to large-sized mammals. It appears likely that bone was being processed for grease extraction (see Johnson 1985; Lintz 1976:87-88; Vehik 1977:172 for discussions of bone processing and grease rendering). This is particularly true of Feature 2, where 260 of the 786 specimens (33 percent) recovered were spirally fractured. It is likely that deer and medium-sized artiodactyl make up much of these assemblages, though the fragments preclude further identification. Of the sample of deer and mediumsized artiodactyl recovered from nonfeature areas, 20 of 43 specimens were spirally fractured.

Another important taphonomic factor was burning. More than half the assemblage was identified as

being burned, from both flotation- and nonflotation-recovered contexts (n = 1,009). For Features 2 and 6–11, more than half of the specimens were burned. Although most of the assemblage was burned, it is interesting to note that very little was actually calcined. Whether the burning was intentional (as with disposal of bones into the fire) or unintentional (shallowly buried bones inadvertently burned as a result of a fire being built over them) could not be ascertained, although given the presence of thermal features at the site and the large amount of incompletely burned bone, it would appear that much of the burning was unintentional.

Only two specimens exhibiting definitive cultural modification were identified, and only one of these is considered to be intentionally modified (i.e., a possible tool). The first was a

Table 33. Taphonomy by feature	y feature					·						
		Midde	Midden Deposits: Analysis Unit 1	: Analysis	Unit 1		No	Nonmidden Deposits: Analysis Unit 2	eposits: Ans	dysis Uni	t 2	
	l eature l	S eature S	9 ərutsə	8 eature	e arute 9	slatotdu	Jonfeature	7 eature	01 eature 10	'eature 11	slatotdu	E
Taphonomic Attribute	Ъ	Н	Ы	F	H	\mathbf{S}	N	Ь	Ь	Я	\mathbf{S}	Totals
light weathering	32	784	330	25	292	1,463	323	150	5	က	481	1,944
heavy weathering	ı	2	I	I	I	2	I	I	I	ı	0	2
unbroken	1	7	1	I	6	18	4	6	I	ı	13	31
angular breakage	31	519	303	15	260	1,128	237	118	2	က	363	1,491
spiral breakage	ı	260	26	10	23	319	85	23	I	ı	105	424
impact fracture	I	1	I	I	I	П	I	I	I	ı	0	1
unburned	17	362	83	7	121	290	285	58	က	-	347	937
charred or tanned	15	404	232	18	160	829	35	26	2	2	92	924
calcined	I	20	15	I	11	46	က	36	I	ı	39	85
rodent gnawed	ı	1	I	I	I	1	I	က	I	ı	3	4
acid-etched	1	187	2	ı	2	192	1	1	I	ı	1	193

medium- to large-sized mammal fragment from Feature 2. It has an impact point, indicating that a hard object such as a hammerstone had struck the bone. Given the high amount of fragmentation in the assemblage and cultural association of artifacts and features, it is surprising that more were not identified. Given the extensiveness of the fragmentation, however, many impact scars may have subsequently been destroyed by further processing of the bone. The second modified specimen is a medium/large-sized mammal long bone fragment from Feature 9 that is spirally fractured and charred. One edge exhibits rounding and striations that run the length of the specimen. The purpose for this modification or of this artifact is unknown.

Comparison of Nonflotation and Flotation Samples

Faunal materials from nonfloated and floated fill did result in a difference in recovery. Specimens recovered from flotation were more numerous, smaller, and were much less likely to be identifiable. This is because the samples from flotation represented virtual total recovery of the osseous remains from those contexts. As bone degrades through weathering, fragmentation, or other processes, the material often fragments. Recovery of these fragments by coarser methods (such as ½-inch-mesh hardware screening) results in a smaller recovery of these fragmented materials. This disparity in numbers gives the impression that flotation only

adds background noise, but it is simply a result of better recovery. In this case, flotation not only increased sample size, but also increased the numbers of identified taxa. Emydid turtle, Colubrid snake, the two smallest mammal sizes, Leporid, small rodent, gopher, large artiodactyl, and pronghorn were all recovered from flotation. Of course, the large artiodactyl and pronghorn elements did not require flotation for their elements to be recovered. However, the gopher identification was based on tooth recovery only. Additionally, most of the cottontail rabbit, nearly half the jackrabbit, most of the medium-sized rodent, and most of the rat remains came from flotation. Without this virtual total recovery of osseous remains, the presence of these taxa would be greatly underrepresented.

SUMMARY

Faunal specimens recovered from 41CV413, Subarea B are dominated by indigenous terrestrial taxa. The large quantity of spirally fractured specimens indicates that bone was being processed for the rendering of grease. This appears to be especially true within Feature 2. The possible processing of bone (most likely by boiling) for grease apparently resulted in a high frequency of bone dissolution. The large amount of burned bone in the assemblage appears to be the result, at least in part, of unintentional burning. The use of flotation aided in the recovery of a larger diversity of taxa than would have been recovered otherwise, but also resulted in the increased recovery of unidentifiable remains.

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APPENDIX C: Macrobotanical Analysis of Soil Flotation Samples from the Clear Creek Golf Course Site (41CV413, Subarea B)

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This report presents results of the macrobotanical analysis of 38 flotation samples totaling 432.5 liters recovered during the 1999 test excavations conducted at 41CV413, Subarea B, an open campsite-burned rock midden located within the boundaries of Fort Hood, Texas. The analysis was conducted to identify the botanical assemblage from the site and to use the data to infer prehistoric land use in the region.

LABORATORY METHODS

Flotation samples are samples of archeological sediment that have been floated in water to separate lighter charred plant remains from heavy material such as rock or caliche and to remove lighter material such as clays and silts that can be suspended in water and rinsed out of the sample. The light plant material is usually caught on fine-mesh material such as cheese-cloth, or on very fine-mesh screen smaller than 0.450 mm. Sediment samples were floated by personnel from Prewitt and Associates.

Standard archeobotanical laboratory procedures were followed during analysis. The samples were first opened and dried in an herbarium dryer. Each sample was then sorted through a series of four nested geological screens with mesh sizes of 4 mm, 2 mm, 1 mm, and 0.450 mm. The materials caught on all of the sieve levels, including the pan, were scanned for floral parts, fruits, and seeds. The carbonized macrobotanical samples submitted for identification were sorted and identified. Identification of all carbonized wood was accomplished by using the snap technique, examining specimens at 8X to 45X magnification with a hand lens or a binocular dissecting microscope and comparing them to samples in herbarium at the Texas A&M

University. Identifications were made using reference collections at the Paleoethnobotany Laboratory, Texas A&M University. Carbonized wood was treated in the same manner.

Due to the poor preservation encountered at most open sites, only carbonized plant remains were considered for inclusion in the archeological assemblage. Some uncarbonized plant material was noted in order to aid in understanding the post-depositional formation processes occurring at the site, but this uncarbonized

material was not included in any quantification of macrobotanical remains.

RESULTS OF THE MACROBOTANICAL ANALYSIS

Archeobotanical Assemblage

The samples contained 103 wood fragments weighing 2.55 g, 2 acorn fragments, and 1 seed. Wood taxa represented in the samples were oak, elm, and sycamore (Table 34). A single charred seed was recovered during the project from Feature 6 (F-20). It measured 4 mm in length and was identified as *Plantago lanceolata*, or water plantain. *Plantago* is a cosmopolitan genus, and plantain leaves of several species have been reportedly used as greens or potherbs by groups across North America and Europe (Castetter 1935; Hedrick 1919; Yanovsky 1936). The seeds, however, have no reported use.

The acorn fragments in Features 2 and 9 (F-19 and F-33) provide some evidence suggesting that acorn processing may have occurred at the site. However, such a small quantity of fragments could easily have been incorporated into the fire incidentally with a load of oak fuel wood. Acorn fragments have been recovered from other sites in the region, such as at 41CV1553 and 41CV1555, an indication that acorn processing activities were probably common (Dering 2000). Acorns may have been parched before the meat was pounded into flour, increasing the possibility that they would be accidentally charred (Gifford 1936). Parching would dry the acorns and kill insect eggs, improving the storability of the resource.

Acorns are processed into flour or meal by first removing the thin shell around the meat and then pounding the meat into flour. The shell

Table 34. Plant taxa identified in the samples

Taxon	Common Name	Plant Part
$Plantago\ lanceolata$	plantain	seed
$Platanus\ occidentalis$	sycamore	wood
$Quercus\ { m sp.}$	oak	acorn, wood
Ulmus sp.	elm, cf. American elm	wood

may be removed with a small chipped stone blade. Depending on the species of oak, tannins may need to be leached from the flour by soaking it in water. Live oak acorns, however, are low in tannins and may not need to be leached (Gifford 1936; Baumhoff 1963).

In regions (such as California) from which adequate ethnographic records are available, acorn-processing sites often are associated with bedrock processing features. These processing features are described as mortars of varying depth or flattened grinding slicks that have been pecked into bedrock or boulders (Jackson 1991).

Conclusion

The archeobotanical assemblage from 41CV413, Subarea B is very reduced, as

indicated by a very low seed concentration (.002/liter). The small size of the charred fragments that comprise the wood assemblage is also indicative of poor plant preservation. Of the 106 fragments noted in the samples, only 3 were large enough to be recovered from a 4-mm screen (Table 35). The rest of the charred wood material ranged between 2 and 4 mm in length, making identification very difficult. Finally, 14 of the 38 samples (37 percent) contained only small flecks of charcoal of insufficient size for identification.

While other features within the site may contain pockets of moderately well-preserved plant remains, the reduced nature of the archeobotanical assemblages from the features investigated in 1999 indicates that the site as a whole is not likely to provide significant amounts of data on prehistoric plant use.

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Table 35. Flotation samples, provenience, liters floated, and identifications

Sample	Provenience	Context	Volume (liter	Volume (liters) Common Name	Plant Part	Count	Weight (g)
F-1	TU 1, Level 3 (20–30 cm)	Feature 1, northwest quad	7.75	Oak	Wood	5	0.10
F-2	TU 1, Level 4 (30–40 cm)	Feature 1, northwest quad	6.25	NCPR	I	I	I
F-3	TU 3, Level 4 (30–40 cm)	Feature 2, northeast quad	8.50	Oak	Wood	7	0.10
F-4	TU 3, Level 5 (40–50 cm)	Feature 2, northeast quad	8.50	indeterminate	Wood	2	0.10
F-5	TU 1, Level 5 $(40-50 \text{ cm})$	Feature 1, northwest quad	00.9	indeterminate	Wood	2	0.10
F-6	TU 5, Level 11 (100–110 cm)	Feature 5, northwest quad	10.50	indeterminate	Wood	I	I
F-7	TU 3, Level 6 (50-60 cm)	Feature 2	9.50	Sycamore	Wood	9	0.10
F-8	TU 3, Level 6 (50–60 cm)	Feature 6	13.25	Oak	Wood	က	0.10
F-9	TU 1, Level 7 (60-70 cm)	general level, northwest quad	8.00	indeterminate	Wood	က	0.10
F-10	TU 4, Level 5 (40–50 cm)	Feature 2	6.50	NCPR	I	I	I
F-11	TU 1, Level 8 (70–80 cm)	general level	9.25	NCPR	I	I	I
F-12	TU 5, Level 11 (100–110 cm)	Feature 5	6.75	NCPR	I	I	I
F-13	TU 4, Level 6 (50–60 cm)	Feature 2	8.00	NCPR	ı	I	I
F-14	TU 1, Level 9 (80-90 cm)	Feature 7	9.75	Oak	Wood	9	0.10
F-15	$TU \ 3 \ (60-80 \ cm)$	Feature 6	53.50	NCPR	I	I	I
F-16	$TU \ 6 \ (102-110 \ cm)$	general level	13.75	NCPR	I	I	I
F-17	TU 4, Level 7 (60–70 cm)	Feature 2	6.50	indeterminate	Wood	1	0.05
F-18	TU 1, Level 10 (90-100 cm)	Feature 7, northwest quad	7.75	NCPR	I	I	I
F-19	TU 4, Level 8 (70–80 cm)	Feature 2	6.75	Oak	Acorn	П	I
				indeterminate	Wood	œ	0.10
F-20	TU 3 (63–74 cm)	Feature 6	3.25	Water plantain	Seed	1	I
				Oak	Wood	3	0.10
F-21	TU 3 (48–64 cm)	Feature 6, southeast quad	12.75	Oak	Wood	4	0.10
F-22	$TU \ 3 \ (52-67 \ cm)$	Feature 6, southwest quad	5.50	Oak	Wood	2	0.10
F-23	$TU \ 1 \ (77-108 \ cm)$	Feature 7	25.50	Oak	Wood	2	0.10
				indeterminate	Wood	12	0.10
F-24	TU 7 (97-105 cm)	Feature 11	11.50	NCPR	I	I	I
F-25	$TU \ 3 \ (72-80 \ cm)$	Feature 6	00.9	NCPR	I	I	I
F-26	$TU \ 3 \ (62-76 \ cm)$	Feature 6	11.50	NCPR	I	I	I
F-27	1	1	I	not assigned	I	I	I
F-28	TU 1, Level 11 (100–110 cm)	Feature 7, northwest quad	7.25	NCPR	I	I	I
F-29	TU 9, Level 7 (60–70 cm)	Feature 8, south half	6.50	Oak	Wood		0.10

APPENDIX D: Analysis of Skeletal Remains from the Clear Creek Golf Course Site (41CV413, Subarea B)

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INTRODUCTION

On 24 May 1999, human skeletal remains removed during excavations at the Clear Creek Golf Course on Fort Hood were examined. These remains had been recorded as Feature 4, a burial found in a backhoe trench but not hand excavated. The analysis took place at the Fort Hood Archeology Laboratory. All materials were recorded using forms from the Standard Osteological Database (Buikstra and Ubelaker 1994). At the direction of the Fort Hood Cultural Resources Management Program director, none of the remains were washed before they were examined.

INVENTORY

The first bag consisted of loose bones removed from Feature 4 when the burial was exposed in Backhoe Trench 2. This skeletal material was all human. Elements recovered included the os coxae (represented by left and right ilia and a left pubis), three rib fragments, the medial or chin portion of the mandible, the neural arch of a lumbar vertebra, and shafts of the left humerus, left radius, left ulna, and portions of the left femur. Unidentified skeletal material was limited to three long bone diaphysis (shaft) fragments. Several teeth were recovered as well, including a permanent right mandibular central incisor and permanent right and left mandibular first premolars.

The second bag contained human and faunal skeletal material recovered through screening ca. 3 m³ of backdirt removed by the backhoe from near Feature 4. Human skeletal elements recovered in this manner included portions of the left femur and left fibula shafts, the shaft of the left tibia, and also fragments of the frontal bone and both parietals. A small portion of the body of the left scapula was recovered. Two teeth were identified—a permanent left maxillary first molar and a deciduous right mandibular second molar. The bag of screened materials also included four unidentified human cranial fragments and one human long bone diaphysis fragment.

In part because the bones were not washed, 24 long bone fragments could not be positively identified as human bones, and 72 long bone diaphysis fragments were identified as faunal. Three epiphysis fragments and an occipital fragment also were identified as faunal. Among the faunal bones, both large and small animals were represented, including birds and unidentified ungulates (e.g., deer, cow). Faunal bones were removed and bagged separately from the human remains; these were not examined further.

INTERPRETATIONS

About 23–30 separate elements are represented in the sample of human bones, along with 14 teeth (Tables 36 and 37).

Minimum Number of Individuals

No whole elements or parts of elements were duplicated among the materials examined from the two bags. Therefore, the minimum number of individuals (MNI) represented is one. All of the bones also appear to be at the same relative stage of development in terms of size and epiphyseal fusion, and the teeth appear to be in concurrent stages of development. The portions of left femur shaft found in the two bags fit together, indicating that they came from the same individual. This evidence supports the hypothesis that all of the human bones belong to one individual.

Age

All observed long bone epiphyses are unfused, indicating a maximum age of approximately 16. The distal humerus is typically the first of the long bones to initiate epiphyseal fusion. Because the distal humerus was included in this sample, this upper age limit is based on the latest age at which the epiphyses of the humerus are fused. Other long bone epiphyses may fuse at later ages. Furthermore, the observed elements of the os coxae (both ilia and a pubis) were not fused together, and the iliac crest was unfused. This indicates that the individual had not yet reached puberty.

Dental development is considered a more reliable indicator of age than epiphyseal fusion because it is typically less affected by metabolic growth disturbances than are long-bone length and epiphyseal fusion. None of the permanent teeth in this individual had completed development of the root or closure of the root apex.

Table 36. Inventory of human bones represented (excluding teeth)

Bone Group	Element	$Completeness^*$	Length	Width	Diameter
Cranial bones and	Mandible	3	_	_	_
joint surfaces	Left frontal	3	_	_	_
	Right frontal	3	_	_	_
	Left parietal	3	_	_	_
	Right parietal	3	_	_	_
Post cranial bones	Scapula body	3	_	_	_
and joint surfaces	Left ilium	1	79.60	80.29	_
	Right ilium	3	_	_	_
	Left pubis	2	35.82	_	_
	Left acetabulum	2	_	_	_
	Right acetabulum	2	_	_	_
	Left auricular surface	1	_	_	_
	Right auricular surface	3	_	_	_
Ribs	3–10, grouped	3	_	_	_
Vertebrae	4th lumbar neural arch	2	_	_	_
Long bones	Left humerus diaphysis	1	ca. 53	_	13.64
	Left radius diaphysis	1	_	_	_
	Left ulna diaphysis	1	_	_	11.70
	Left femur diaphysis	1	_	_	16.34
	Left tibia diaphysis	2	_	_	_
	Left fibula diaphysis	3	_	_	_

NOTE: All measurements are in millimeters.

Based on standards of dental development published by Ubelaker (1989), this individual appears to be approximately 8 years old, plus or minus 2 years.

Although a certain degree of wear was apparent on the deciduous molar, this is not unusual considering the relatively poor quality and meager amount of enamel found in deciduous teeth and the relative length of time that the tooth had probably been in occlusion in this individual (approximately 4–7 years). The amount of wear seen in this molar is consistent with that seen in other prehistoric Central Texas Native American individuals of the same developmental age. No wear was apparent on any of the permanent teeth.

Measurements of the bones appear to be consistent with the age indicated by dental development. Thus, the best age estimate based on long-bone measurements and dental evidence is ca. 8 years old plus or minus 2 years.

Sex

Sex could not be determined for this prepubescent individual. Skeletal characteristics typically used to establish the sex of an individual are secondary sexual characteristics, and therefore are not apparent until after puberty. Subjective determinations of sex for subadults, particularly of this young age, are not much more than 50 percent accurate (i.e., little better than guessing).

Biological Affinity

Biological or population affinity could not be determined for this subadult. Determinations of biological affinity are usually reserved for

^{*} Completeness:

^{1 = &}gt;75 percent present.

^{2 = 25-75} percent present.

 $^{3 = \}langle 25 \text{ percent present.} \rangle$

Table 37. Inventory of human teeth

Group	Tooth*	Presence**	Development***
Maxillary	Right second molar (D)	2	
·	Left first molar (P)	1	12
Mandibular	Left second molar (D)	5	
	Left first molar (D)	5	
	Left second premolar (P)	5	
	Left first premolar (P)	8	
	Left canine (P)	5	
	Left central incisor (P)	5	
	Left lateral incisor (P)	5	
	Right central incisor (P)	1	12
	Right lateral incisor (P)	5	
	Right canine (P)	5	
	Right first premolar (P)	1	9
	Right first molar (D)	5	

^{*} D = deciduous tooth; P = permanent tooth.

- 1. Present, but not in occlusion.
- 2. Present, development completed, in occlusion.
- 3. Missing, with no associated alveolar bone.
- 4. Missing, with alveolus resorbing or fully resorbed: premortem loss.
- 5. Missing with no alveolar resorption: postmortem loss.
- 6. Missing, congenital absence.
- 7. Present, damage renders measurement impossible, but other observations are recorded.
- 8. Present, but unobservable (e.g., deciduous or permanent tooth in crypt.

^{***} Tooth development for teeth coded "1" for presence.

Code	Stage
1	Initial cusp formation
2	Coalescence of cusps
3	Cusp outline complete
4	Crown 1/2 complete
5	Crown 3/4 complete
6	Crown complete
7	Initial root formation
8	Initial cleft formation
9	Root length 1/4
10	Root length 1/2
11	Root length 3/4
12	Root length complete
13	Apex 1/2 closed
14	Apex closed

Codes used in Standard Osteological Database forms (Buikstra and Ubelaker 1994:7, 49–50).

^{**} Tooth presence:

adults, and typically rely on intact crania. Given the context and apparently early relative date of this skeletal material, however, it seems likely that this individual was Native American.

Pathology

No pathological conditions were noted in this individual's bones, but they were not washed, so the dirt adhering to the cortex may have obscured more subtle signs of disease or injury. No linear enamel hypoplasias were noted on the teeth, but again, lesser degrees of these enamel defects would have been obscured by dirt

adhering to the surface of the teeth.

SUMMARY

All of the human bones recovered from Feature 4 in Backhoe Trench 2 at 41CV413, Subarea B appear to have belonged to a child who was approximately 6 to 10 years of age at death (median age 8 years). Sex and biological affinity could not be determined, and no pathological conditions were apparent. Faunal bones recovered from the screening of trench fill apparently represented several different animals, but these were not directly associated with the burial.

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1989 Human Skeletal Remains. 2nd ed. Taraxacum Press, Washington D.C. APPENDIX E: Provenience Data for Artifacts Recovered from the Clear Creek Golf Course Site (41CV413, Subarea B)

135 1 18 43 44 13 50Totals Modified Bone 0 Modified Shell 0 1 0 Metates Mano 1 1 13 44 Debitage 14 41 134 Unmodified Core 1 0 1 Flakes 0 Edge-modified Unifaces 1 0 Miscellaneous End/Side Scraper 0 1 End Scrapers Bifacial Knife 0 Bifaces 0 1 Miscellaneous Finished Bifaces 1 0 1 Late-stage to Table 38. Provenience of artifacts recovered by analysis unit stage Bifaces 0 1 Early- to Middle-Perforators 0 1 Preform 1 Dart Points Feature GENERAL PROVENIENCE TU 2, Level 2 (10–20 cm) TU 1, Level 6 (50-60 cm)TU 2, Level 3 (20–30 cm) TU 1, Level 4 (30–40 cm) TU 1, Level 2 (10-20 cm)TU 1, Level 5 (40–50 cm) TU 1, Level 3 (20–30 cm) TU 1, Level 1 (0-10 cm) TU 1, flotation sample, TU 1, flotation sample, TU 1, flotation sample, Level 5 (40–50 cm) wall of BHT 2 (80 cm)Level 3 (20-30 cm) Level 4 (30-40 cm) wall of BHT 2 (64 cm) ANALYSIS UNIT 1 BHT 5 (10-20 cm)backdirt, BHT 18 surface collection $TU \ 2 \ (24-30 \ cm)$ backdirt, BHT 2 backdirt, BHT 1 TU 3 (29.5 cm) TU 1 (45 cm) Provenience Subtotals

Table 38, continued																			
Provenience	Feature	Part Points	Preform	Perforators	Early- to Middle- stage Bifaces	Late-stage to Finished Bifaces	Miscellaneous Bifaces	Bifacial Knife	End Scrapers	End/Side Scraper Miscellaneous	səəslinU	मिबष्टe-modiffied मिबष्टes	Core	Unmodified Debitage	Mano	Metates	Iləd2 bəfiboM	Modified Bone	slatoT
TU 3, flotation sample (48–64 cm)	9	I	I	1	I	I	ı	ı	I	1	1	I	1	29	ı	1	1	I	29
TU 3, flotation sample $(52-67 \text{ cm})$	9	I	I	I	I	I	I	I	ı	ı	ı	ı	ı	က	ı	1	ı	ı	က
TU 3, flotation sample (60–80 cm)	9	I	I	I	I	I	ı	ı	I	ı	ı	I	ı	34	ı	ı	1	I	34
TU 3, flotation sample (62–76 cm)	9	I	ı	ı	ı	ı	ı	ı	ı	1	1	ı	1	18	1	1	1	I	18
$TU \ 3 \ (63-74 \ cm)$	9	I	ı	ı	ı	ı	ı	ı	1	1	1	ı	1	1	1	1	1	I	1
TU 3, flotation sample (63–74 cm)	9	I	ı	ı	I	ı	I	ı	ı	ı	ı	ı	ı	5	ı	I	ı	I	3
$TU \ 3 \ (65-74 \ cm)$	9	I	ı	ı	ı	1	ı	ı	ı	ı	ı	ı	ı	ı	ı	1	ı	ı	73
$TU \ 3 \ (72-80 \ cm)$	2	I	ı	ı	ı	I	ı	ı	ı	1	1	ı	ı	19	ı	ı	1	ı	19
TU 3, flotation sample (72–80 cm)	9	I	I	I	I	I	ı	ı	I	ı	ı	I	ı	2	ı	ı	1	I	5
$TU \ 3 \ (90-95 \ cm)$	7	I	ı	ı	I	ı	I	ı	ı	ı	ı	ı	ı	က	ı	I	I	ı	က
TU 3, Level 3 (20–30 cm)	2	2	I	ı	1	1	I	I	ı	ı	ı	ı	ı	114	ı	I	ı	ı	118
TU 3, Level 4 (30–40 cm)	2	1	ı	ı	I	I	1	ı	ı	ı	ı	ı	ı	78	ı	1	ı	ı	80
TU 3, flotation sample, Level 4 $(30-40 \text{ cm})$	23	I	1	I	1	1	23	1	1	1	I	1	ı	16	1	1	I	1	18
TU 3, Level 5 (40–50 cm)	7	1	ı	ı	ı	ı	ı	ı	ı	ı	ı	ı	ı	29	ı	ı	ı	ı	89
TU 3, flotation sample, Level 5 $(40-50 \text{ cm})$	2	I	1	1	1	1	ı	ı	ı	1	I	1	ı	9	ı	1	ı	1	9
TU 3, Level 6 (50-60 cm)	2	I	I	I	I	I	ı	ı	I	ı	ı	I	ı	œ	ı	ı	1	I	œ
TU 3, flotation sample, Level 6 $(50-60 \text{ cm})$	73	I	I	ı	I	I	I	I	I	I	ı	ı	ı	13	I	I	ı	ı	13
TU 3, flotation sample, Level 6 $(50-60 \text{ cm})$	9	I	I	I	I	I	I	I	I	I	ı	ı	I	_	1	I	I	I	7
TU 3, Level 9 (80–90 cm)	2	2	I	ı	I	I	I	I	ı	ı	ı	ı	ı	32	I	I	ı	ı	34
$TU \ 4 \ (17-20 \ cm)$	2	2	ı	ı	ı	က	ı	ı	ı	ı	1	4	ı	190	ı	1	1	1	200
TU 4 (48 cm)	2	П	ı	ı	ı	ı	ı	ı	1	1	1	ı	1	1	1	1	1	1	1
TU 4, flotation sample (80–93 cm)	6	I	ı	1	ı	ı	1	ı	ı	1	1	1	1	38	1	ı	1	ı	38
TU 4, Level 3 (20–30 cm)	2	4	ı	ı	1	1	က	I			1	9	ı	1,017	I	I	ı	ı	1,035
TU 4, Level 4 (30–40 cm)	2	9	ı	-	1	5	4	1	_	1	3	4	_	839	1	1	1	1	863

Table 38, continued																			
Provenience	Feature	stnio¶ trsU	Preform	Perforators	Early- to Middle- stage Bifaces	Late-stage to Finished Bifaces	Miscellaneous Bifaces	Bifacial Knife	End Scrapers	End/Side Scraper	suoənsiləcəli Unifaces	Edge-modified Flakes	ЭтоО	Unmodified Debitage	onsM	Metates Medifical Show	Modified Shell Bone	slatoT	
TU 4, Level 5 (40–50 cm)	2	က	ı	ı	1	3	3	1	1	l	1	5	1	350	1	I I	I	36	365
TU 4, flotation sample, Level 5 (40–50 cm)	73	1	1	1	I	I	-	I	1	1	I	I	ı	25	I	l I	1		26
TU 4, Level 6 (50–60 cm)	2	1	I	ı	ı	1	I	ı	1	ı	ı	ı	ı	294	1	ı			596
TU 4, flotation sample, Level $6 (50-60 \text{ cm})$	2	1	1	1	1	I	1	1	I	1	I	1	ı	41	1	ı	1		41
TU 4, Level 7 (60–70 cm)	2	I	1	ı	ı	I	I	ı	1	1	ı	ı	ı	80	1	- 1			80
TU 4, flotation sample, Level 7 ($60-70 \text{ cm}$)	2	1	1	1	1	I	1	1	I	ı	I	ı	I	18	I	l I	ı		18
TU 4, Level 8 (70–80 cm)	2	I	ı	ı	ı	ı	ı	ı	ı	ı	ı	1	ı	35	1	1	ı		36
TU 4, flotation sample, Level 8 (70–80 cm)	2	1	1	I	I	I	1	1	I	1	I	ı	I	26	ı	I	ı		26
$TU \ 8 \ (15-20 \ cm)$	2	က	I	ı	I	ı	I	ı	ı	ı	ı	ı	I	I	ı	' I	ı		က
TU 8, flotation sample (64–70 cm)	2	I	ı	ı	I	ı	ı	ı	ı	ı	ı	ı	I	13	ı	' 	1		[3
TU 8, flotation sample (64–77 cm)	6	I	ı	ı	ı	I	I	ı	ı	ı	ı	ı	I	18	ı	' 	. 1		61
TU 8 (65 cm)	6	1	ı	ı	I	I	ı	ı	ı	ı	ı	ı	ı	I	ı	' I			1
TU 8, flotation sample (67–80 cm)	6	I	ı	ı	I	I	ı	ı	ı	ı	ı	ı	ı	31	ı	' I			31
TU 8 (77 cm)	6	I	ı	ı	1	ı	ı	ı	ı	ı	ı	ı	ı	ı	1	1			1
TU 8, flotation sample (79–87 cm)	6	I	ı	ı	I	ı	ı	ı	ı	ı	ı	ı	ı	35	1	1			35
TU 8, Level 4 (30–40 cm)	2	4	ı	ı	ı	ı	ı	ı	ı	ı	ı	ı	ı	ı	ı	1 -			23
TU 8, Level 5 $(40-50 \text{ cm})$	2	I	ı	1	I	ı	I	ı	ı	ı	ı	ı	ı	I	ı	1			1
TU 8, Level 6 (50–60 cm)	2	23	ı	ı	I	ı	I	ı	ı	ı	ı	ı	I	I	ı	 			2
TU 9 (49 cm)	2	1	ı	ı	I	I	ı	ı	ı	ı	ı	ı	ı	I	ı	 			1
TU 9 (54 cm)	2	1	ı	ı	I	ı	I	ı	ı	ı	I	I	I	I	ı	' 			П
TU 9, Level 5 (40–50 cm)	2	П	I	I	ı	I	ı	I	ı	1	I	ı	ı	ı	1	' 			1
TU 9, Level 6 (50–60 cm)	2	က	ı	ı	ı	ı	1	ı	ı	1	ı	ı	ı	1	1	1			က
TU 9, Level 7 (60-70 cm)	2	4	ı	1	I	1	Ι	ı	Ι	ı	ı	ı	ı	Ι	1	· -			9

4,003 13 6223 Totals Modified Bone 1 Modified Shell Metates Mano Debitage 821 13 22Unmodified Core Flakes 23 Edge-modified Unifaces ∞ Miscellaneous End/Side Scraper End Scrapers Bifacial Knife Bifaces 18 Miscellaneous Finished Bifaces 16 Late-stage to stage Bifaces Early- to Middle-Perforators Preform91 Dart Points Feature TU 1, flotation sample (77–108 cm) TU 1, Level 11 (100–110 cm) TU 1, Level 10 (90–100 cm) TU 10, Level 4 (30-40 cm) TU 10, Level 9 (80–90 cm) TU 11, Level 6 (50-60 cm)TU 11, Level 8 (70–80 cm) TU 11, Level 9 (80-90 cm)TU 10, Level 5 (40–50 cm) TU 10, Level 6 (50–60 cm) TU 1, flotation sample, Level 11 (100–110 cm) TU 1, Level 9 (80–90 cm) TU 1, Level 7 (60–70 cm) TU 1, Level 8 (70–80 cm) Level 10 (90-100 cm)TU 1, flotation sample, TU 1, flotation sample, TU 1, flotation sample, TU 1, flotation sample, Level 9 (80–90 cm) TU 9, flotation sample, Level 7 (60–70 cm) Level 8 (70–80 cm) Level 7 (60–70 cm) ANALYSIS UNIT 2 TU 1 (73 cm) TU 1 (86 cm) Provenience Subtotals

Table 38, continued

Table 38, continued														·				·	
Provenience	Feature Feature	Part Points	Ртеготт	Perforators	Early- to Middle- stage Bifaces	Late-stage to Finished Bifaces	Miscellaneous Bifaces	Bifacial Knife	End Scrapers	End/Side Scraper	suoənalləseiM Unifaces	Edge-modified Flakes	Core	bəfilibomnU Debitage	onsM	Metates	Modified Shell	enod beitiboM	zlstoT
TU 3 (90–110 cm)	I	ı	1	1	1	ı	ı	1	I	ı	1	1	ı	1	ı	ı	ı	ı	2
TU 4, Level 9 (80–90 cm)	ı	ı	1	ı	ı	ı	ı	1	1	ı	ı	1	ı	10	1	1	1	1	10
$TU \ 5 \ (85-117 \ cm)$	5	1	ı	ı	ı	ı	I	1	1	I	ı	ı	ı	2	1	1	ı	1	2
TU 5, flotation sample, Level 11 (100–110 cm)	5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	Н
TU 7 (93-100 cm)	ı	ı	1	ı	ı	ı	ı	1	1	ı	1	1	ı	9	1	1	1	1	9
TU 7, Level 11 (100–110 cm)	I	ı	ı	ı	ı	ı	I	1	ı	ı	1	I	ı	2	1	1	1	1	2
TU 9, flotation sample (69–71 cm)	I	I	ı	I	ı	I	I	ı	ı	ı	I	1	ı	17	1	1	ı	ı	17
TU 9, flotation sample $(70-75 \text{ cm})$	I	ı	ı	ı	ı	ı	I	1	1	I	I	1	ı	85	1	1	ı	1	85
TU 9, Level 8 (70–80 cm)	I	1	ı	I	I	I	I	1	1	I	I	ı	I	I	1	1	I	ı	1
TU 9, Level 9 (80–90 cm)	ı	1	ı	ı	ı	ı	ı	ı	ı	ı	ı	ı	ı	I	ı	ı	ı	ı	1
TU 11, flotation sample (110–115 cm)	10	1	I	ı	I	ı	I	I	ı	ı	ı	1	ı	œ	I	ı	ı	I	œ
Subtotals		ro	0	0	П	0	0	0	0	0	0	2	0	289	0	0	0	0	297
TOTALS		66	1	2	9	16	18	1	2	1	∞	25	1	4,124	1	11	1	1	4,318

APPENDIX F: Summary of National Register Testing and Data Recovery Research Design for Archeological Investigation of 41CV413

Douglas K. Boyd

Submitted to the Cultural Resource Management Program, Department of Public Works, Fort Hood, Texas, June 1999

INTRODUCTION AND MANAGEMENT SUMMARY

As part of Fort Hood's ongoing cultural resources management program, Prewitt and Associates, Inc. (PAI) was contracted to conduct archeological testing of site 41CV413 on the Clear Creek Golf Course on Fort Hood, Texas. A significant portion of the site was accidentally damaged in early February 1999 by mechanical tree removal in conjunction with construction activities. Damage to the site was severe, and Fort Hood archeologists (Kleinbach 1999) reported that 11 percent of the surface area was disturbed. Fort Hood archeologists mapped the damaged area on a recent air photo, showing that more than 30 trees of various sizes had been removed (Figure 23). Field observations indicate that some 110 m3 of cultural fill was disturbed, and it is conservatively estimated that between 640 and 1,280 m³ of sediment containing cultural midden deposits was disturbed, assuming that a minimum of 10-20 cm of fill was disturbed across the 6,439-m² area (Kleinbach 1999:3).

Archeologists from PAI conducted testing to reevaluate the site's eligibility for listing on the National Register of Historic Places (NRHP) following the tree removal incident. In May 1999, the site was tested with 19 backhoe trenches and 11 hand-excavated test units (ten 1x1-m units and one 0.5x0.5-m unit). All testing was conducted on Subarea B, the alluvial terrace, and much of it was done in or near the damaged area. Hand excavation was concentrated in the central portion of Subarea B, where one or more burned rock middens were encountered. A human burial was encountered in one backhoe trench; the in situ portion of the burial was not excavated, and the disturbed remains were reburied at their original location. Many intact features, several within the matrix of burned rock middens, were completely or partially excavated. A large number of artifacts, including dozens of diagnostic dart points, were recovered from testing of the midden deposits.

Subarea A, the deflated upland Killeen surface, was determined to have no archeological potential, while Subarea B of 41CV413 is recommended as eligible for listing on the NRHP. A comprehensive data recovery research design is proposed herein. The proposed work includes intensive archeological excavations in one small

portion of the burned rock midden location. Avoidance and protection is recommended for the remainder of the burned rock midden(s) and cultural deposits in Subarea B. The U.S. Army is responsible for long-term care and management.

SITE HISTORY

The terrace containing site 41CV413 is located in the alluvial valley of Clear Creek in northwestern Coryell County. It was not cultivated before the U.S. government took the land (1942–1943). A 1938 air photo (Figure 24) indicates that the area was not cleared of vegetation at that time; the terrace was covered with scattered trees with a dense tree canopy along Clear Creek and its tributary. The presence of identifiable fence lines suggests that livestock grazing may be the only agricultural activity that occurred on the site.

No archeological survey had been done at the time the Clear Creek Golf Course was constructed in 1976, and some areas of the site were disturbed (Cheryl Huckerby, personal communication 1999). The extent of disturbance related to construction appears to have been significant in some areas but minimal in others. A comparison of the modern air photo (see Figure 23) and the 1938 air photo (see Figure 24) indicates that many trees were probably removed during the initial golf course construction phase, particularly from the fairway that cuts through the northern and eastern portion of the site. A few trees were likely removed from the central portion of the site to construct the open-area driving range, but none were cleared from the area immediately east of the driving range.

Site 41CV413 was first recorded in 1982 by George Thomas for the Fort Hood Archeological Resources Management Program. Archeologists from Texas A&M University revisited the site in 1987 and recorded additional information. They observed no evidence of military training disturbances. The site was reported to consist of "two burned rock mounds, a burned rock scatter, and a lithic scatter" (Ensor 1991:87). No collections were made, but observed artifacts included a dart point fragment. The chronology of the site was not known, and no subsurface testing was done. Noting the high potential for intact buried deposits, however, investigators recommended the site be considered potentially eligible for listing on the NRHP. Texas A&M

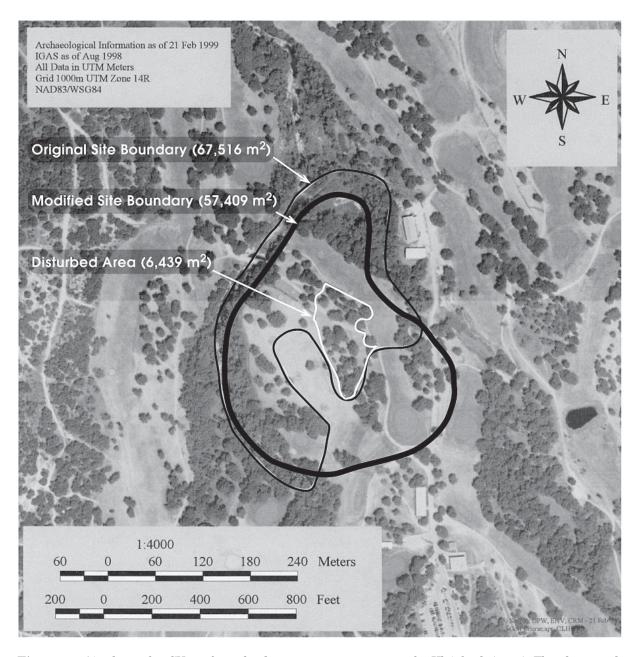


Figure 23. Air photo of 41CV413 from the damage assessment report by Kleinbach (1999). The photograph was taken in August 1998 and the archeological information dates to February 21, 1999. Note the damaged area in the central portion of the site.

archeologists informally called it the Clear Creek Golf Course Mounds site. Because the site is located on the golf course, it was not subject to damage from regular training activities, and therefore, Fort Hood's cultural resources personnel assumed that it was relatively well protected. Thus, 41CV413 was not slated for National Register testing.

In 1999, construction activities related to additions and renovations of the Clear Creek Golf Course were coordinated with the Fort Hood Archeologist within the Department of Public Works (DPW) and with civilian contractors doing onsite work. The site area was reexamined by Fort Hood archeologists, and the sensitive central area of the site was marked on 1998 air



Figure 24. Air photo of 41CV413 taken in 1938.

photo prints. Trees around the perimeter of the area also were flagged, and it was stipulated that no mechanical work was to occur in this area (Kimball Smith, personal communication 1999). Despite prior coordination with the archeology staff and DPW, a heavy machinery operator working for the construction contractor used a bulldozer to remove trees from the central portion of the site in early February 1999. Because this incident was viewed as a violation of the Archeological Resources Protection Act of 1979 (PL 91-190; 42 USC 4321 et seq.) by the federal government, it triggered formal NRHP eligibility testing of 41CV413.

NATIONAL REGISTER TESTING

National Register testing of 41CV413 was conducted by PAI under Deliver Order No. 1 of Contract No. DAKF48-D-99-0009. The field investigation took place in June and July 1999. One week was devoted to backhoe trenching and profile recording, and two weeks were devoted to hand excavation and sampling of cultural deposits and features.

Work Accomplished and Results

The initial field effort included a geomorphic reconnaissance, followed by excavation of 19 backhoe trenches. Site 41CV413, situated on the east side of Clear Creek, extends 390 m north-south by 300 m east west. The irregular shaped area encompasses some 67,000 m². Following the reconnaissance, this large site was divided into Subareas A and B (Figure 25). All of the subsurface testing was done in Subarea B (Table 39).

Subarea A consists of the lower toeslope and valley wall comprising the eroded Killeen surfaces on the north and south margins of the site (Nordt 1992). Since this subarea has little or no potential for containing intact buried cultural deposits, no archeological testing was done.

Subarea B encompasses the alluvial terrace on the east side of Clear Creek, comprised of the upper T_{1a} and lower T_{1b} surfaces. The T_{1b} is located in the northern end of Subarea B and along a tributary drainage that enters Clear Creek at the north end of the site. Backhoe Trenches 12, 13, 15, and 17 were excavated on this surface. No cultural materials were encountered and no hand excavation was done.

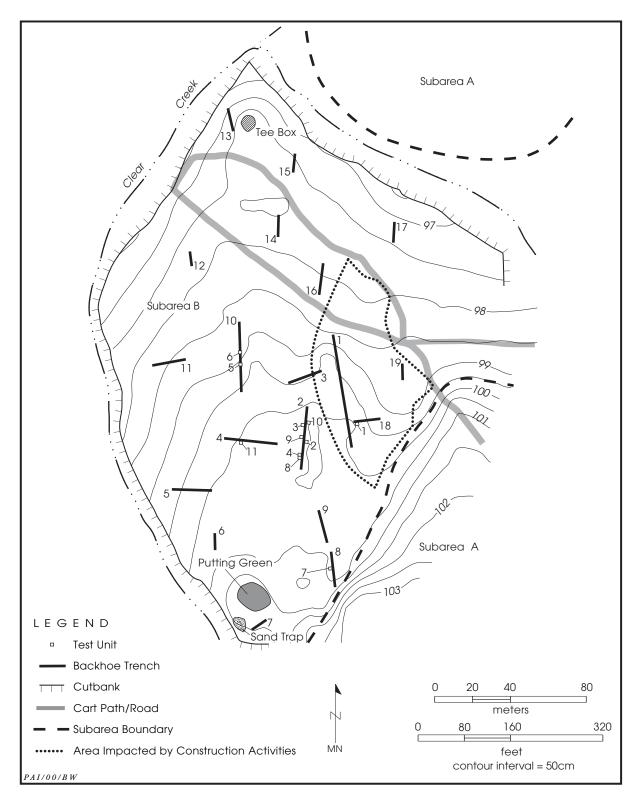
Fifteen trenches (Backhoe Trenches 1–11, 14, 16, 18, and 19) were excavated on the T_{1a} surface. Cultural deposits—primarily burned rocks—were encountered in many of these trenches. Eleven test units were also excavated in this part of Subarea B (Table 40). A total of 6.27 m³ of fill was hand excavated. Recovery of cultural material from nonmidden contexts was low, but as many as 1,000 flakes per 10-cm level were recovered from some parts of the midden. The most significant archeological information can be derived from the midden feature(s), internal features within the midden matrix, and features in nonmidden contexts.

Eleven cultural features were identified at 41CV413 (Table 41), but Features 1 and 2 are probably parts of the same large midden. It also is possible that Feature 3 is part of this same midden, although this is less certain. The large midden covers at least 40x40 m and could be 60x60 m or larger. The best exposure is found in Backhoe Trench 2, but the midden also was sampled with Test Units 2-4, 8, and 9. It rests directly on a gravel facies that caps fine-grained deposits interpreted as Fort Hood alluvium. Thus, the entire midden complex appears to date, based on geomorphic assessment, to the late Holocene. More-precise chronological assessment will require radiocarbon dates on associated organic remains.

Features 6 and 9 are basin-shaped hearths or remnants of earth ovens within the large midden. Feature 8 is an ash dump also located within the midden.

The other features are from nonmidden areas. Features 5 and 10 are basin-shaped hearths, and Feature 11 is a nonmidden burned rock concentration. Feature 7 is an occupation zone.

Feature 4 is a human burial found below the large midden deposit at ca. 78–104 cm. It appears to predate the midden accumulation in this area, but could be contemporaneous with midden deposits nearby. The precise age of this burial is not known. Backhoe Trench 2 disturbed a portion of the burial, but over half of it remained intact in the floor and east wall of the trench. Approximately 3 m³ of fill removed by the backhoe was screened through ¹/₄-inch-mesh hardware to recover all of the human remains. As directed by the Fort Hood archeologist after consultation with the Tonkawa Tribe, the disturbed remains were taken to the CRM office



 $\textbf{Figure 25.} \ \text{Site map of } 41\text{CV}413 \ \text{showing locations of impact area, backhoe trenches, and hand-excavated test units.}$

Table 39. Summary of backhoe trenches at 41CV413

Backhoe Trench	Dimensions	Cultural Materials Observed
1	47.0x0.8x1.5 m	Feature 1 present from the surface to a maximum depth of 60 cm, extending ca. 40 m in trench walls
2	23.5x0.8x1.5 m	Features 4, 6, and 8 exposed in trench walls; Feature 2 present from 15 to 20 cm to a maximum depth of 90 cm, extending the length of the trench
3	13.0x0.8x0.7 m	scattered burned rocks in the A horizon (ca. 50 cm thick)
4	23.0x.0.8x1.2 m	Feature 2 present from 30 to 90 cm, extending the length of the trench but thinning to the west
5	15.0x0.8x1.5 m	Feature 3 present from 10 to 20 cm to a maximum depth of 60 cm, extending 13 m west from the east end of the trench
6	6.5x0.8x0.8 m	scattered burned rocks in the A horizon, south end of the trench
7	6.0x0.8x1.2 m	few burned rocks
8	14.0x0.8x2.3 m	Feature 11 and associated scattered burned rocks
9	14.0x0.8x2.5 m	occasional burned rocks
10	23.0x1.5x3.6 m	burned rock lens at the south end of the trench at 45–50 cm, extending ca. 7 m north in both walls; Feature 5; buried soil at ca. 150 cm
11	14.0x0.8x1.6 m	none observed
12	5.0x0.8x0.8 m	none observed
13	9.5x1.5x3.0 m	none observed
14	8.0x0.8x2.0 m	none observed
15	7.0x0.8x1.9 m	none observed
16	11.0x0.8x1.6 m	burned rocks at 60 and 120 cm
17	6.5 x 0.8 x 2.1 m	none observed
18	11.0x0.8x1.7 m	Feature 1 present from the surface to a maximum depth of 60 cm, extending the length of the trench; Feature 7 exposed in south wall
19	6.0x0.8x1.4 m	none observed

at Fort Hood where they were examined and inventoried by an osteologist. More than 30 whole or fragmentary elements were found, including portions of the skull, teeth, ribs, scapula, pelvis, and leg and arm bones. The disturbed remains were reinterred with the remaining part of the burial on 3 June 1999 by the Fort Hood archeologist. All backhoe trenches and test units at 41CV413 were backfilled on 4 June 1999.

Charred wood (and possible charred seeds) were recovered from 13 of 37 sediment samples taken for flotation from various contexts. The majority of samples yielding

charred remains were from general midden matrix and hearth features (Table 42). The flotation recovery is sufficient to yield materials for radiocarbon dating and interpretable samples of macrobotanical remains.

Assessment of NRHP Eligibility

It is recommended that Subarea A of 41CV413 be considered not eligible for listing on the NRHP. This area has no potential to contain intact buried cultural deposits, and no further archeological work or management consideration is warranted.

Table 40. Summary of test units at 41CV413

Test		Amount		
Units	Depth of Excavation	Excavated (m³)		
1	0–120 cm	1.20		
2	0–30 cm	0.30		
3	0–20 cm removed as overburden			
	20-90 cm (1x1 m unit)	0.70		
	90–110 (0.5x0.5 m unit)	0.05		
4	0-17 cm removed as overburden			
	17–90 cm	0.73		
5	80–115 cm	0.30		
6*	102–110 cm	0.02		
7	93–110 cm	0.17		
8	0–15 cm removed as overburden			
	15–70 cm	0.55		
9	0–25 cm removed as overburden			
	25–90 cm	0.65		
10	0–20 cm removed as overburden			
	20–90 cm	0.70		
11	0–20 cm removed as overburden			
	20–110 cm	0.90		
* Test Unit 6 was entirely a 0.5x0.5-m unit.				

Subarea B contains extensive burned rock middens, other features, and cultural debris from the surface to as much as 100 cm deep or more across a large portion of the area. Using the prehistoric site significance criteria developed for Fort Hood by Ellis et al. (1994), Subarea B is recommended as eligible for listing on the NRHP under Criteria D. In addition, the presence of an intact human burial below the midden means that Subarea B must automatically be considered National Register eligible. Archeological testing revealed several burned rock midden accumulations and other intact features in nonmidden contexts. Within these deposits, an ash lens and remnants of at least three intact hearths or earth ovens were encountered and either partially or wholly excavated. Macrobotanical remains are present in the feature fill, and animal bones and mussel shells are preserved within the midden. Thus, the midden and nonmidden cultural deposits also clearly meet the NRHP significance criteria and can yield important information through archeological investigation.

Following Black et al. (1997:310), the research potential of a burned rock midden may be assessed by evaluating the degree of organic preservation, structural integrity, and site stratification. Black et al. (1997) also note that a site need only score moderately well in one or two dimensions to have considerable potential to yield valuable data. For the burned rock midden at 41CV413, organic preservation is moderate, structural integrity is high, and site stratification is minimal. Thus, investigating the midden formation processes would clearly be the most important research goal.

DATA RECOVERY RESEARCH DESIGN

While a significant portion of the burned rock midden deposits in Subarea B of 41CV413 were disturbed by accidental tree removal activities, archeological testing revealed that a substantial portion of the midden deposits remain intact and contain internal features that may yield important data. The research design

proposed herein is aimed primarily at investigating the burned rock midden deposits. It calls for intensive data recovery work on only a portion of the midden area, leaving a large section of intact midden deposits preserved. If additional project-related impacts can be avoided in the future, the presence of the golf course offers good protection for the midden. Because of its location, this artifact-rich midden has not been vandalized, unlike many other middens on Fort Hood. Because the site will remain eligible for listing on the NRHP following this partial data recovery investigation, the U.S. Army is still responsible for the long-term protection and preservation of Subarea B of 41CV413.

Burned Rock Midden Theory and Research Potential

Until the past decade, studies had provided little evidence of how burned rock middens were formed and the nature of human activities that took place around them. A 1988 symposium on

Table 41. Summary of features at 41CV413

Feature	Туре	Excavation Units	Depth of Excavation	Minimum Dimensions
1*	burned rock midden	Test Unit 1	0–60 cm	40 m north-south by 12 m east-west
2*	burned rock midden	Test Unit 3	20–60 and 72–90 cm	40x40 m
		Test Unit 4	17–80 cm	
		Test Unit 8	15–70 cm	
		Test Unit 9	25–70 cm	
		Test Unit 10	20–90 cm	
		Test Unit 11	30–90 cm	
3*	burned rock midden	Backhoe Trench 5	_	13 m east-west by 10 m north-south
4	burial pit	Backhoe Trench 2	78–107 cm	exposed portion was $45~\mathrm{cm}$ east-west by $40~\mathrm{cm}$ north-south
5	basin-shaped hearth	Test Unit 5	85–117 cm	100x100 m
6**	basin-shaped hearth	Test Unit 3	45–76 cm	100x100 m
7	occupation zone	Test Unit 1	77–115 cm	100x100 m
8**	ash dump	Test Unit 9	59–70 cm	70 cm north-south by 40 cm east-west
9**	basin-shaped hearth	Test Units 4 and 8	64–93 cm	135 m north-south by 93 cm east-west
10	basin-shaped hearth	Test Unit 11	108–125 cm	100 cm east-west by 70 cm north- south
11	burned rock concentration	Test Unit 7	97–105 cm	58 cm east-west by 54 cm north- south***

^{*} Features 1, 2, and 3 may all be the same midden deposit.

burned rock middens (Hester 1991) was the first step toward more-rigorous and problem-oriented research. Since then, more investigations and data analyses of middens have occurred; these are discussed at length in Fort Hood literature (e.g., Ellis et al. 1994:58–63; Quigg and Ellis 1994; Kleinbach et al. 1995). In addition, experimental field techniques were employed during the Higgins Site investigation of a burned rock in Bexar County (Black et al. 1998). The recent synthesis by Black et al. (1997), Hot Rock Cooking on the Greater Edwards Plateau, provides a thoughtful analysis of Central Texas middens using ethnographic evidence, intensive archeological work at four midden sites, and

comparisons with archeological data from other Central Texas middens.

There is still considerable disagreement as to the range of variability in middens and interpretations of the activities that formed them, but it is generally agreed that most middens contain internal features representing discrete activities. The most commonly recognized internal features are large, basin-shaped hearths commonly interpreted as remnants of earth ovens. Evidence of subterranean pit cooking has been found for cultures all over North America and elsewhere in the world (e.g., Black et al. 1997:3–6; Ellis 1997:46; Honea 1962). The current prevailing theory is that most of the burned rock

^{**} Features 6, 8, and 9 are found within Feature 2.

^{***} These are maximum dimensions—Feature 11 was entirely contained within the unit.

Table 42. Summary of flotation recovery from 41CV413

			C	bserved M	laterials		
Flotation Sample	Feature Association	Provenience	Microdebitage	Microfauna	Charred Wood	Charred Seeds/Nuts	Total Sample Volume (liters)
1 2 3 4	1 1 2 2	Test Unit 1 (20–30 cm) Test Unit 1 (30–40 cm) Test Unit 3 (30–40 cm) Test Unit 3 (40–50 cm)	X X X X	X			7.44 6.00 8.16 8.16
5	1	Test Unit 1 (40–50 cm)	X				5.76
6 7 8 9 10	5 2 6 none 2	Test Unit 5 (100–110 cm) Test Unit 3 (50–60 cm) Test Unit 3 (50–60 cm) Test Unit 1 (60–70 cm) Test Unit 4 (40–50 cm)	X X X X	X X X			10.08 9.12 12.72 7.68 6.24
11 12 13 14 15	none 5 2 7 6	Test Unit 1 (70–80 cm) Test Unit 5 (100–110 cm) Test Unit 4 (50–60 cm) Test Unit 1 (80–90 cm) Test Unit 3 (60–80 cm)	X X X X X	X X X	X (?)		8.88 6.48 7.68 9.36 51.36
16 17 18 19 20	none 2 7 2 6	Test Unit 6 (100–110 cm) Test Unit 4 (60–70 cm) Test Unit 1 (90–100 cm) Test Unit 4 (70–80 cm) Test Unit 3 (63–74 cm)	X X X X X	X X X (?) X X	X		13.20 6.24 7.44 6.48 3.12
21 22 23 24 25	6 6 7 11 6	Test Unit 3 (48–64 cm) Test Unit 3 (52–67 cm) Test Unit 1 (77–108 cm) Test Unit 7 (97–105 cm) Test Unit 3 (72–80 cm)	X X X	X X X	X X X (?)	X (?)	12.24 5.28 24.48 11.04 5.76
26 28* 29 30 31	6 none 8 2 8	Test Unit 3 (62–76 cm) Test Unit 1 (100–110 cm) Test Unit 9 (60–70 cm) Test Unit 8 (64–70 cm) Test Unit 9 (60–70 cm)	X X X X	X X X X	X X	X (?)	11.04 6.96 6.24 4.80 4.32
32 33 34 35 36	below 2 9 none 9 9	Test Unit 9 (69–71 cm) Test Unit 8 (64–77 cm) Test Unit 9 (70–75 cm) Test Unit 8 (67–80 cm) Test Unit 8 (79–87 cm)	X X X X	X X X X	X X X		7.20 18.96 29.28 21.84 19.44
37 38	9 10	Test Unit $4 (80-93 \text{ cm})$ Test Unit $11 (110-115 \text{ cm})$	X X	X	X		14.64 10.08
Totals			36	26	11	2	415.20
*Sample	27 was no	t assigned.					

debris in middens represents heat-fractured rocks cleaned out of baking pits and discarded nearby. Given enough time, a considerable amount of fire-cracked rock accumulates.

Although many Central Texas middens are rich in artifacts, these are invariably found within the general and seemingly homogenous matrix and can only be assigned chronological or cultural meaning in a general sense, if at all. Attempts to analyze the artifacts scattered throughout midden matrixes have failed or produced questionable results when the complexities of midden formation were ignored. A midden's matrix may be viewed as an anthropogenic deposit—a massive accumulation of discarded debris, primarily burned rocks. In many cases, the general midden matrix is largely uninterpretable because the deposit represents many thousands of years of human activities that cannot be separated into meaningful analysis units. Using simple stratigraphic principals to excavate and interpret thick midden deposits has proven to be fruitless; large samples of artifacts cannot be sorted into meaningful temporal groups with any degree of confidence. We now recognize that many of the human activities that form middens (i.e., repeated episodes of pit cooking, cleanout, and discard) are the same activities that cause extensive disturbance to the surrounding mass of rock debris and associated artifacts.

Nevertheless, if archeologists are careful when they investigate middens, and dig them with the right questions in mind, there are ways to identify internal features that represent discrete, datable activities within the general matrix. Consequently, most researchers now propose that excavating burned rock middens is fruitful only if done with the intent of identifying midden structure and formation processes (Black et al. 1997:312). Recent midden research has focused on what can be learned by recognizing and examining discrete activities within middens to support functional inferences (Black et al. 1997:313).

The most cost-effective investigative technique for large middens is to use mechanical digging tools to locate internal features and then use careful hand excavation for internal features and random sampling. Using a combination of mechanical trenching or stripping to obtain vertical and horizontal exposures and hand excavation to obtain interpretable samples is the

recommended approach to maximize the data recovery efforts (see Black et al. 1997:307–413).

From a theoretical standpoint, Black et al. (1997:295–301) propose that the "classic Central Texas burned rock midden" is a "center-focused" feature in which repeated episodes of cooking in a central earth oven occurred. Each use episode is followed by cleanout, discard of unusable rocks, and rebuilding of the oven in the same location. According to their model, a classic midden, then, will exhibit a mounded profile and will be round to oval in plan view if not substantially altered by postdepositional processes. Black et al. (1997:288–289, 295–296) argue that extremely large and irregular shaped middens, such as are common along the valley toeslopes and alluvial terraces on Fort Hood, are actually complexes of intersecting center-focused middens. They believe that massive accumulations of rock in large middens result from countless use episodes over long periods of time, in contrast to smaller middens that represent fewer use episodes.

Other researchers disagree that all Central Texas middens are center-focused, mounded accumulations resulting only from repeated use of earth ovens. While they acknowledge that there are many fine examples of center-focused, classic Central Texas middens, archeological testing of numerous burned rock middens on Fort Hood (Abbott and Trierweiler 1995; Trierweiler 1994) and at O.H. Ivie Reservoir (Treece et al. 1993) has led these researchers to propose a distinction between "mounds" and "middens." At Fort Hood, mounds generally occur in nondepositional settings and have an obvious and distinctive domed shape, while middens occur on toeslopes along valley walls and in alluvial/colluvial sediments within stream valleys. In this taxonomy, summarized by Kleinbach et al. (1995:767–776), middens are thick amorphous deposits that lack significant relief and exhibit considerable variability in size and shape. Kleinbach et al. (1995) acknowledge that mounds form as heat-fractured rocks are discarded from repeated cleaning, rebuilding, and reuse of a single, central earth oven. They contend that the larger, irregular-shaped middens are much more complex and not simply a series of intersecting mounds as Black et al. (1997:288-289,295-296) suggest. They also contend that mounds are special activity sites quantitatively and qualitatively different from the large, amorphous middens. The latter are generally associated with

evidence of repeated habitation in the form of a wide variety of artifacts such as debitage; chipped stone tools in various stages of manufacture; broken animal bones; mussel shells; and broken, discarded, and reused chipped stone and ground stone tools.

Black et al. (1997:288–289) suggest that the big Fort Hood "middens" simply represent complex series of intersecting mounds associated with different camp activities, but that the food processing activities that formed the middens are essentially the same as the food processing activities that formed the mounds. Kleinbach et al. (1995) suggest that the middens are more complex and were formed through a greater range of food processing activities. Following their model, cooking in earth ovens may certainly account for a large portion of the fire-cracked rock debris, but middens are distinctive for three main reasons. First, the selection of locations for placement of earth ovens within middens was not constrained in any way, and their structures will not necessarily reflect "intersecting mounds." Second, the foods processed in central ovens in upland mounds were probably limited, while a wider range of foods were probably processed in a wider variety of ways at midden localities. Finally, other food processing techniques and camping activities (e.g., clean out from stone boiling and discard of fractured rocks from surface hearths) may have contributed significant amounts of firecracked rocks to middens.

These two opposing views present very different models for how the large burned rock middens in alluvial valleys on Fort Hood formed. The test excavations at 41CV413 revealed a large burned rock midden accumulation with multiple internal features that does not fit well into Black's model. It is noteworthy that Black et al. (1997:289) state in the Hot Rocks synthesis that, "The Fort Hood work notwithstanding, we again repeat our assertion that not a single truly large burned rock midden has ever been thoroughly investigated and reported in detail." A thorough and careful examination of a portion of the midden deposits at 41CV413 has much to offer in furthering our knowledge of midden formation and Central Texas prehistory.

General Approach

The general investigative approach proposed here for 41CV413 has two primary

objectives. The first is to examine the structure and formation of the burned rock midden deposits, and the second is to obtain a sample of features and artifacts nearby that represent contemporaneous nonmidden activities. Extracting information about activities carried on near and around the midden is an extremely important research goal for investigating burned rock middens (Black et al. 1998:313). Consequently, the proposed work is a comprehensive, multidisciplinary strategy that will examine a portion of the extensive midden deposits and sample nonmidden cultural sediments while leaving large portions of the site's cultural deposits intact and undisturbed. The proposed work includes a combination of (1) mechanical stripping to provide horizontal and vertical exposures, (2) identification and hand excavation of internal features within the midden matrix, (3) extensive sediment sampling and flotation, (4) sampling and analysis of burned rocks, and (5) a range of laboratory techniques for analyzing various samples and cultural materials. The target area for beginning mechanical excavation of the midden deposits will be on either side of Backhoe Trench 2, where several internal features have already been identified and examined (i.e., Features 6, 8, and 9) within the general midden matrix (Feature 2). Hand excavations in the midden area will concentrate on investigating specific internal features that are identified and may represent discrete activities within the homogenous midden matrix. The target area for beginning the nonmidden area mechanical and hand excavations will be around Backhoe Trench 10 in the vicinity of Test Units 5 and 6. To maximize this research, a range of specialized investigative techniques will be employed before and during the fieldwork and data analysis. Table 43 summarizes the relationships between research questions, or data needs, and the field and laboratory methods for acquiring and analyzing appropriate archeological data.

Field and Laboratory Methods

Proton Magnetometer Survey

Work by Abbott and Frederick (1990) has shown that proton magnetometer surveys are an effective subsurface remote sensing technique that can aid in locating internal features

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Data needs	Field technique for data acquisition	Laboratory technique for data analysis
Chronology and temporal relationships	 horizontal and vertical archeological control using a total data station provenience control for collected artifacts observations of relationships between features and artifacts 	 radiocarbon dating or organic remains amino acid racemization of snail shells typological studies of projectile points typological studies of stone tools natural and cultural stratigraphic relationships vertical distribution of features and cultural materials seriation of diagnostic artifacts
Depositional context and site formation	 geomorphic and sedimentological profile descriptions sediment sampling collection of land snails 	analysis of natural stratigraphy geometry analysis of depositional units analysis of pedogenic development through soil texture and chemical analysis amino acid racemization of snail shells
Nature and range of cultural activities	 broad area mechanical stripping and hand excavations to maximize feature search investigation of midden and nonmidden areas careful excavation and detailed observations of cultural features (plan and profile drawings; sampling photographic documentation) 	feature morphology and content analysis to infer function analysis of abundance and diversity of feature types analysis of abundance and diversity of artifact types abundance and diversity of nonartifactual remains (e.g., unmodified bone and shell; burned rocks)
Group size and duration of occupations	 quantitative assessment of feature sizes mapping and concise definition of site boundaries proton magnetometer survey to define potential for features in unexcavated areas 	 extent of cultural deposits (vertical and horizontal) number, size, content, and inferred function of features spatial arrangement of features and artifacts artifact assemblage diversity (statistical artifact analysis) use-intensity index (statistical artifact analysis)
Subsistence and technology	 quantitative observations of feature-associated burned rocks (midden and nonmidden) construction of experimental cooking features excavation of midden matrix sample units 	analysis of feature morphology and content analysis to infer function analysis of artifact morphology to infer function abundance and diversity of macrobotanical taxa abundance and diversity of faunal taxa archeomagnetic analysis of burned rocks calorie yield represented by faunal and floral remains calorie yield represented by cooking feature capacity lithic use wear analysis organic residue analysis on stone tools

Table 43, continued		
Data needs	Field technique for data acquisition	Laboratory technique for data analysis
Paleoenvironmental reconstruction	 collection of land snails, animal bones, and macrobotanical remains collection of flotation samples and sediment column samples from feature and nonfeature contexts 	 abundance and diversity of macrobotanical taxa abundance and diversity of faunal taxa sediment accumulation and rates of deposition stable isotope data for animal remains pollen/phytolith analysis of sediments
Sociocultural organization	 collection of lithic samples from nearest local source areas detailed chemical and/or mineralogical study of artifacts made of nonlocal materials 	 typological studies of projectile points lithic raw material studies to infer group mobility exotic (nonlocal) materials studies to infer trade and group interaction

within complex middens before excavation. Their work with four middens in west-central Texas reveals distinctive differences in the magnetic signatures of center-focused mounds as compared with large middens containing multiple internal features.

The initial field investigation at 41CV413 will begin with a proton magnetometer survey of large portions of the main midden area. Using a state-of-the-art (e.g., a Geometrics 858 cesium) gradiometer that takes continuous readings, a two-person crew can prepare the site grid, conduct the survey, and download and interpret the data in three to four days. The actual survey would cover much of the site, including all areas where mechanical block excavations are planned. Results of the magnetometer survey could then be used to predict the number, types, and locations of features within the target excavation areas. Based on the testing results, interpretation of the magnetic data could be refined to predict the number, types, and locations of features in other areas that will be preserved.

Mechanical Stripping and Feature Search

After the magnetometer survey has been completed and the magnetic data are interpreted, Backhoe Trench 2 will be reopened. Several target areas, each rectangular block measuring 4.5 m wide and 15 m long, will be selected for initial investigation based on previous testing results and the magnetic data. Each target area will be excavated using a Gradall, and placement of the machine and backdirt will be critical factors influencing the selection.

One dimension of each Gradall block will be determined by the length of the trenches that the Gradall can effectively excavate—4.5 m (Pat Hobson, Fort Hood Department of Public Works, personal communication 1999). All cultural features encountered by the Gradall will be documented in plan and profile and hand excavated (see below).

The precise number and placement of target areas for Gradall excavation cannot be determined at this time, and the total volume excavated by machine or by hand will be controlled in large part by how many internal features requiring hand excavation are encountered. If relatively few internal features are discovered, it is likely that a larger area can be stripped. In contrast, if many internal features are found, the work will go considerably slower and less overall area will be stripped. The minimum volume of sediment to be stripped by the Gradall is 338 m³, or five 4.5x15-m blocks; however, excavations could cover up to 540 m³ (eight 4.5x15-m blocks) if time permits. At least two or three excavation blocks will need to be in progress at any given time so that the Gradall can be used efficiently and move back and forth between blocks; the Gradall can move to another block and continue work while profiles are being cleaned and examined and units are being excavated in other blocks. Most of the Gradall block areas will sample deposits containing the burned rock midden(s), but at least one or two of the excavation blocks will sample nonmidden areas where contemporaneous deposits are suspected.

For the first target blocks, excavation will begin off an old backhoe trench and the Gradall excavation will proceed in one direction from that trench (Figure 26). For example, the first target area block would be excavated eastward from Backhoe Trench 2. The Gradall would be set up so that it can excavate 80-cm-wide strips parallel to the backhoe trench and dump the backdirt out of the way directly behind the machine. The excavation will proceed from left to right, with each new trench exposing another 80 cm of the deposits and creating another vertical profile. Excavation of each trench will be monitored carefully by an archeologist. A broom will be used to sweep the floor of each scrape if necessary, and work will stop to examine any possible features encountered in the bottom of the Gradall trench. The 80-cm width is deemed appropriate because most of the significant and recognizable internal midden features are expected to be larger than 100 cm in size. The 80-cm-wide strips will maximize excavation coverage but still ensure that the chances of identifying all of the large features in profiles are good. If no features are encountered in the bottom of the strip, the excavation will proceed until the 6-m-long strip has been taken down below the base of the midden deposits. The Gradall will then move to work in another area while the archeologists examine and record the east wall profile (see below) and decide if there are any features that warrant hand testing. All possible features in the midden

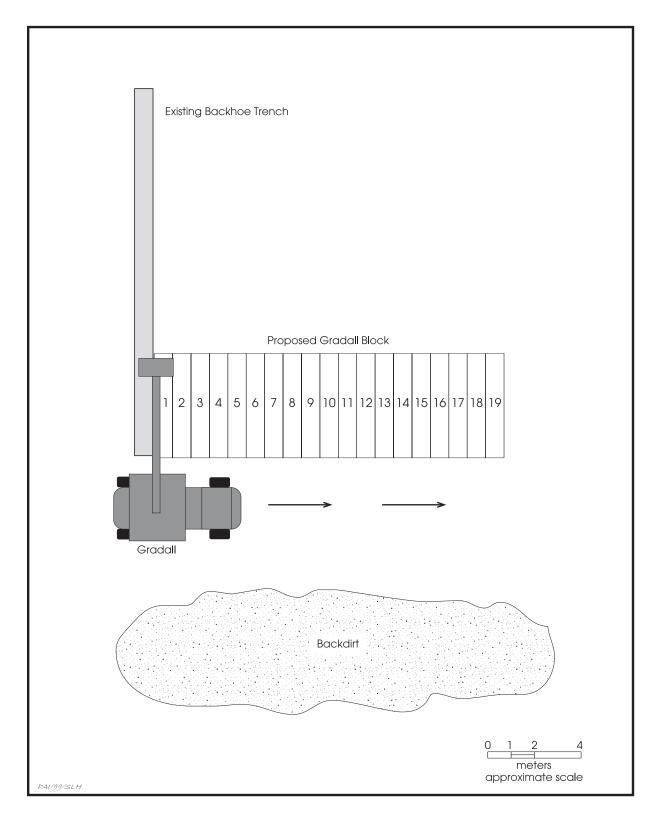


Figure 26. Schematic view of Gradall excavation technique for 41CV413.

matrix will be investigated.

When a trench profile has been completed and possible features have been dealt with, the Gradall will be brought back to this area to excavate another 80-cm-wide strip along the east wall. In this manner, the excavation block will increase in size as the work progresses. After the first strip, it will be easy to examine all profiles at eye level.

Profile Examination and Documentation

After each 80-cm-wide Gradall strip is excavated, the profile will be cleaned with water using a pressurized sprayer and then allowed to dry so that differences in soil matrix texture and rock sizes will stand out. Each profile will be photographically documented using a series of black- and-white photographs taken at standard intervals. The trench walls will then be examined closely for internal features and other evidence of discrete activities within the midden. For every possible internal feature, a feature number will be assigned, the feature will be described, and plan or profile views will be drawn. In warranted, each feature will then be investigated with a hand-excavated test unit. Nonassociated midden matrix above a feature may be removed and discarded as overburden, and the matrix below may not be hand excavated

Midden Matrix Sample Units

Four 1x1-m test units will be excavated beside the 4.5x15-m Gradall blocks to obtain samples of the general midden matrix. Because artifacts from general midden deposits are usually jumbled, the goal of this study will not be to recover artifacts (although projectile points will be analyzed) but to study the burned rocks. The sample units will be excavated in 20-cm levels and the size, count, and weight of all burned rocks will be recorded for each level. Observations on the nature of the rocks and their fracture patterns will be made. This information will be used as comparative data (i.e., examining feature rocks versus midden fire-cracked rocks) to help define feature construction and interpret feature function. All sediments from each sample unit will be screened through 1/4-inch-mesh hardware cloth and all artifacts will be collected. Aside from the sample units, all other hand

excavation done in midden matrix deposits will concentrate on recognizable internal features (see below).

Investigation of Internal Midden Features

Thorough scientific investigation of the midden deposits will involve detailed work with every internal feature, including accurate descriptions, quantification of burned rocks, and intensive flotation sampling and analysis. In addition, archeomagnetic analysis of feature-associated burned rocks has the potential to reveal important aspects of human behavior relating to midden accumulations. Experimental archeomagnetic studies will be done, along with limited field sampling of burned rocks.

HAND EXCAVATION AND RECORDING OF INTERNAL FEATURES

Each possible internal feature will be examined closely. If the feature might possibly represent a discrete activity area (e.g., a remnant of a baking pit or a debris dump), it will be hand excavated. Features will be examined and mapped in plan and profile whenever possible. Documentation will include black-and-white and color slide photography, detailed plan and profile drawings, and a feature data form. Burned rocks associated with internal features will be quantified and sampled. Sediments associated with features will be collected as flotation samples.

It is impossible to predict the number of features that will be encountered or the amount of hand excavation that will be needed to expose and study them. However, it is likely that at least 50 internal features will be encountered and a minimum of 25 m³ of hand excavation will be needed.

FLOTATION SAMPLING AND PROCESSING

Flotation sampling has proven an important technique for sites indicating intensive heating and cooking activities. Large quantities of sediment associated with the internal features, general midden matrix, and nonmidden features will be taken as flotation samples. All samples will be processed in a Flote-Tech system. Artifacts will be removed from the coarse

fraction and cataloged according to their provenience. The fine fraction of each sample will then be submitted to a macrobotanical specialist for analysis. Analysis of macrobotanical remains will concentrate on interpreting feature function by identifying wood fuels and possible food resources.

BURNED ROCK DATA QUANTIFICATION

Burned rocks associated with internal midden features will be quantified by sorting them into size categories and getting counts and weights for each size category. The data will be recorded on a Burned Rock Quantification form. Burned rocks in the midden matrix sample units will also be quantified in this manner. Through a comparative analysis of internal features and general midden matrix, this information will be used to help distinguish different types of internal features and infer feature function. This data also will be important for understanding the intensity and nature of proton magnetism signatures of different types of features (i.e., identifying which features show up best in a magnetometer survey and understanding why).

ARCHEOMAGNETIC EXPERIMENTATION AND BURNED ROCK SAMPLING

One extremely important research question about burned rock middens is whether all of the fire-cracked rock represents debris discarded from baking pits or whether other types of heating and cooking activities that have yet to be recognized may contribute significant amounts of these rocks. One such activity that is difficult to recognize archeologically and may be obscured in a jumble of midden debris is stone boiling. The heating of stones and their subsequent use to boil water is a widespread cooking technique documented in ethnographic literature but seldom recognized in the archeological record because the evidence is difficult to detect (Ellis 1997:63). Experimental and archeological studies of burned rocks in known contexts have shown, however, that there may be subtle differences in the breakage morphology (i.e., the number and angularity of fractures) between rocks used in earth ovens and rocks used for stone boiling (Lucas and Frederick 1998). More important, archeomagnetic investigations can reveal whether rocks cooled in place or were moved as they cooled, a critical factor in distinguishing between earth oven rocks and boiling stones. When multiple rocks within a feature are analyzed, the data are useful for inferring the cooling history of the feature and interpreting its function (Gose 1994; Takac 1998). For any heated rock that is properly sampled in the field, it is possible with a fair degree of accuracy to determine through archeomagnetic analysis if the rock cooled entirely in place, it cooled in one place but was subsequently moved, or if its cooling history was erratic (i.e., moved one or more times during cooling). This information can help determine different types of features found within burned rock midden deposits.

The 41CV413 experimental archeomagnetic study will consist of constructing four types of experimental burned rock features where temperature and cooling histories of the rocks are known. Twenty archeomagnetic samples will be taken from each of the four experimental features and submitted to an archeomagnetic consultant for analysis. The four features constructed will be an earth oven, a surface hearth, and two types of boiling stone dumps. The oven and surface hearth rocks will be heated and cooled completely in place. One boiling stone dump will consist of rocks that are heated, dropped in a container of water that is brought to a strong boil, allowed to cool completely in the water, and then dumped. The other type of boiling stone dump will have rocks that are removed from the boiling water with tongs and dumped in various stages of cooling. Additional rocks may be added to either experiment to keep the water boiling for at least 15 minutes. Temperature recording devices and thermocouples will be used to document the actual heating histories of the rocks in the experimental features. The archeomagnetic data from these experimental features will then be used to help interpret the archeomagnetic data obtained on prehistoric features.

The 41CV413 archeological archeomagnetic study will consist of taking and analyzing 20 samples from each of six archeological features. The sampling will select good examples of what appear to be different types of internal features, and the goal will be to see if there are significant

differences in the archeomagnetic signatures of burned rocks in the different features. This work is a continuation of experimental and archeological work recently done by Takac and Gose (1997). The field and analysis methods used for the archeomagnetic study will be similar to those described by Takac (1998:127–130).

Investigation of Nonmidden Areas

At least one Gradall block will be excavated in the nonmidden cultural deposits near Backhoe Trench 10. Previous test excavations revealed that nonmidden cultural deposits and features found in Test Units 5 and 6 warrant additional investigation and may be contemporaneous with the midden deposits nearby. Consequently, this will be the primary target area for sampling the nonmidden activities. In addition to the Gradall block, if stratified deposits of sufficient integrity are encountered, a total of 20 m3 of hand excavation will be reserved for investigating such discrete deposits with an excavation block. This effort will be allocated at the discretion of the Field Supervisor and Principal Investigator. The work may use1x1-m units or larger 2x2-m units, but some form of horizontal control will be maintained. An electronic total station will be used to map features and artifacts in the nonmidden block excavations (see below).

Total Data Station Mapping of Features and Excavations

Site mapping will be done using a Sokkia SET 5F total data station (TDS). The TDS will be onsite at all times, and all significant cultural features, artifacts, and samples will be mapped in place. All other pertinent site data, such as locations of Gradall excavations and hand-excavated units, will be mapped accordingly.

Analysis of Material Culture and Samples

A variety of analytical techniques will be employed to extract interpretable data from various types of artifacts and samples. The nature of any particular analysis will vary depending upon the material and the archeological context. Only artifacts and samples from good archeological contexts (i.e., associated with

datable cultural zones and features) will be subjected to rigorous analysis.

All projectile points will be subjected to detailed attribute and technological analyses because they are temporally diagnostic. Other stone tools and debitage from good archeological contexts will also be intensively analyzed. Artifacts from poorly defined contexts, such as debitage from the midden matrix sample units, will not yield much information and may receive little or no analytical attention.

Special consultants will conduct detailed interpretative analyses of faunal and macrobotanical remains. The studies will be aimed at inferring paleoenvironmental conditions from proxy data and at identifying cultural behaviors relating to resource acquisition and use.

A great deal of effort will be spent in the field to obtain samples of organic materials for radiocarbon dating. It is expected that datable samples will be obtained through sediment flotation and collection of individual specimens (e.g., charcoal fragments or bones). In order to thoroughly understand the midden and nonmidden deposits, each individual feature that yields organic remains will need at least one radiocarbon date and many nonfeature contexts will require dating. Most of the samples will, of necessity, need to be assays done by the accelerator mass spectrometer method (AMS). It is impossible to anticipate how many features will be encountered and how many dates will be needed, but a conservative estimate is that at least 30 AMS dates will be essential to establishing site chronology.

Rabdotus shells will be collected from all archeological deposits during fieldwork and may be subjected to amino acid racemization analyses as pioneered at Fort Hood by Ellis et al. (1996). These studies will be employed if warranted to aid in dating or assessing the archeological integrity or depositional characteristics of nonmidden cultural deposits.

Evaluation of Investigative Techniques

The final task when all of the field and laboratory work has been completed will be to evaluate the investigative techniques employed. A written assessment of the investigative techniques, along with recommendations for future studies, will be incorporated into the report.

ARCHEOLOGICAL REPORTING AND PUBLIC OUTREACH

Technical Report

A draft technical report detailing the methods and findings of all of the studies discussed above will be produced. On review by Fort Hood and the Texas State Historic Preservation Officer, the draft will be edited to incorporate reviewer comments and a final technical report will be produced. The draft and final technical reports will meet standards for reporting set forth by the Council of Texas Archeologists (1982) and Secretary of Interior standards, as well as specific guidelines set by the Fort Hood cultural resource management program.

Public Outreach: On Site Visitation and Popular Report

Archeological research conducted under federal cultural resources laws is for public benefit, and an archeological data recovery project is an excellent teaching opportunity. One of Fort Hood's major problems in managing cultural resources is ongoing vandalism at rock shelters and burned rock middens. Public education regarding the importance of preserving and properly investigating archeological resources is the best long-term solution. The public outreach segment of the 41CV413 data recovery project has two components—an on-site public open house and a popular report on the burned rock middens of Fort Hood.

The public open house should be planned as soon as the fieldwork is scheduled. A oneday open house, if properly planned and executed, could do much to educate Fort Hood soldiers and their families about archeology and the importance of preserving our archeological heritage. The event should be well publicized (newspaper, radio, and television coverage) to attract as many people as possible. It will include a site tour so that people can see archeological excavations in progress and talk to field archeologists. The tour will stress why careful excavation is so important, what can be learned through proper scientific investigation, and what is lost when sites are accidentally or intentionally destroyed. The event should also include short presentations and exhibits on special topics such as the artifacts and how archeologists analyze them, radiocarbon dating, and how a burned rock midden is formed.

As a separate deliverable in conjunction with this project, a popular report on burned rock middens of Fort Hood will be produced. The report will be short (20–30 pages), written for the general public, and well illustrated. Report content should include information on (1) the history of archeology studies at Fort Hood; (2) archeological methods of investigation; (3) interpretations of what burned rock middens represent, who used them, when, and why; and (4) why context is important and why sites should be preserved. This report will have a strong preservation message, with information on the problem of vandalism of burned rock middens and other sites on Fort Hood, laws that protect sites on Federal property, and penalties for violations.

At least 2,000 copies of this report will be produced and distributed to local schools and libraries and be made available for Fort Hood soldiers and people in nearby towns (e.g., Killeen, Copperas Cove, and Gatesville). The report could also be made accessible on the Fort Hood web site.

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